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COMPUTERWORLD

INSIDE

Model 50 winning MIS fans

BY ED SCANNELL
CW STAFF

Despite some complaints from early users about the apparent slowness of the IBM Personal System/2 Model 50's hard disk drive, MIS and micro managers said last week that improved technology actually makes the machine faster than the company's Personal Computer AT. Consequently, the managers said the Model 50 will play a major role in their future corporate computing strategies.

Based on a benchmark test conducted by a major corporation, most applications will run 25% to 50% faster on the Model 50 than they do on the AT, despite the Model 50's 80-msec disk access time, compared with the AT's 40-msec time.

"The Model 50 is faster than an AT, especially with floating-point applications. I am encouraging the Model 50 to be our standard machine," said Jeff Ehrlich, manager of product technology for General Electric Co.'s Information Systems Division.

Ehrlich and other MIS professionals admitted that, initially, they had reservations about the Model 50 because of its slow disk drive. However, they said the system's disk-caching abilities and its 1:1 disk interleaving in IBM's Micro Channel architecture enable it to run applications, particularly disk-intensive applications, measurably faster than the AT runs them.

"If you run disk-intensive applications side by side on the Model 50 and AT, with and without disk caching, you'll see the Model 50 runs 1½ to two times faster," said Ralph Wagner, acting vice-president of marketing for MBI Business Centers, Inc., a retail chain in Rockville, Md.

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Service firms lead buying surge

Financial, insurance companies fuel computer industry turnaround

BY DOUGLAS BARNEY
CW STAFF

The resurgence of the computer industry is being fueled largely by the intensely competitive service side of the economy, with banking, finance and insurance companies leading the buying charge, users and analysts say.

"The people who like to invest in new equipment have the money and need the increased productivity. Finance, banking and insurance all fit in this category," says Ray Ahlberg, a senior analyst with the Department of Commerce's Science and Electronics Group.

Users in those industries agree. "I am buying iron like it is going out of style," says George P. DiNardo, executive vice-president of Mellon Bank, N.A. in Pittsburgh.

The recent boost in computer demand comes as welcome relief to two years of sluggish demand. "We're looking for a pickup in the economy and a pickup in industrial production. This will help computer industry demand," says Jean W. Orr, vice-president of Drexel Burnham Lambert, Inc. in New York.

Capital-spending increases are also helping sales of computers. A survey recently released by The Conference Board in New York reveals a 10% increase overall this year in capital spending, with much of that going to new technology.

Although many service sector firms are eager to buy mainframes, a larger area of growth is microcomputer hardware and software. Much of this activity is prompted by new products from all major vendors, boosting the personal computer replacement

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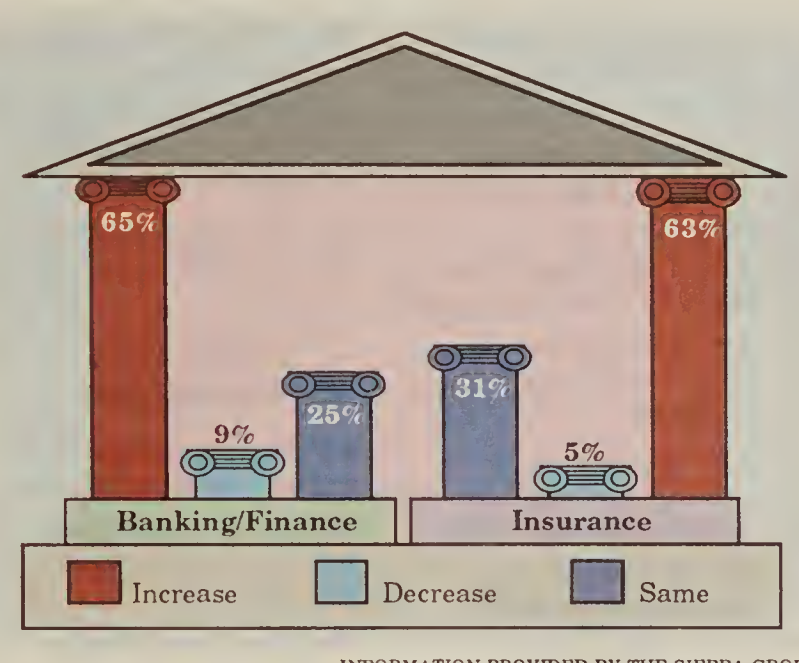
Investing in computers



INFORMATION PROVIDED BY THE SIERRA GROUP
CW CHART: MITCHELL J. HAYES

Systems consulting counts for big bucks at Big Eight

"The MIS executive is becoming a strategist, a true professional at sizing up business needs as well as technical potential. His area of expertise can have unparalleled power in building the future of his organization."

Excerpted from "The Changing Shape of MIS," a 1986 study by Arthur Andersen & Co.

BY CLINTON WILDER
CW STAFF

If a company's chief financial officer and MIS director are invited to separate business lunches at the same restaurant, it is becoming more and more likely that their hosts will be from the same company — a Big Eight accounting firm.

The hallowed halls of the Big Eight are increasingly the homes of custom software developers, systems integrators and network designers. Armed with well-paid consultants and the contention that they know how your business works, Big Eight firms are roaring into computer-related services on the crest of the same tide that is transforming MIS executives from technicians to businessmen.

The emergence of the Big Eight as major players in technology consulting is difficult to quantify, but the firms and services market analysts agree that they are among the fastest growing providers in a rapidly growing field. Mountain View, Calif.-based research firm Input estimates the U.S. professional services market will grow 18% annually to $28.7 billion in 1991, and Input

Continued on page 6

CSP deflects critics, warms up DB2 users

BY CHARLES BABCOCK
CW STAFF

Evaluations of IBM's fourth-generation language, Cross System Product, still vary widely five years after the language's first release. But experienced users of the latest version say it is one of the few development environments that will yield an efficient DB2 production application.

IBM has labeled CSP a strategic product, and some observers think the language has the potential to rival DB2's performance with a slow warm-up followed by a fast take-off in the marketplace.

"DB2 put a substantial cramp into the independent mainframe data base management system market. . . . The fourth-

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Prime time. Prime targets governmental, office markets with EXL 316, a multiuser supermicro system based on an 80386 microprocessor that runs AT&T Unix System V Release 3 and several MS-DOS programs simultaneously. Page 4.

PC language lift. D&B Computing brings fourth-generation language Nomad2 to personal computers with PC Nomad, which incorporates cascading windows and file-transfer capabilities. Page 6.

NEWS

SOFTWARE & SERVICES

MICROCOMPUTING

Programming heaven. Page 63.

NETWORKING

SYSTEMS & PERIPHERALS

MANAGEMENT

Quotable

"All of the computing world is divided into three parts: IBM, DEC and the third world of Unix users."

THOMAS STEPHENSON
THE ANALYTIC SCIENCES CORP.

See story page 12.

COMPUTER INDUSTRY

EMPLOYMENT TODAY

SPOTLIGHT

Not just for the Fortune 500: Mid-size firms are discovering that they can reap cost-saving T1 benefits.
Follows page 54.

IN DEPTH

OPINION & ANALYSIS

DEPARTMENTS

NEWS

Sun now shining on X-Windows standard

BY NINAMARY BUBA MAGINNIS
CW STAFF

MOUNTAIN VIEW, Calif. — Sun Microsystems, Inc. announced last week that it will combine Version 11 of the X-Window system, an emerging standard developed at MIT, with its proprietary Postscript-based Network Extensible Window System (NEWS).

Sun's endorsement of X-Windows lags far behind other major players in the technical and engineering workstation market. In January, many vendors collaborated in announcing a campaign to push for acceptance of X-Windows as an international standard; supporters then included Digital Equipment Corp., Hewlett-Packard Co., Apollo Computer, Inc. and Data General Corp.

Sun plans to merge the X-Window Version 11 system with NEWS, offering a unified window system, the vendor reported.

X-Window Version 11, which is scheduled to be released this fall, will include Sun's contributions to the X architecture through the comment and review of specifications, according to Steve Lerman, MIT's Project Athena director.

MIT will provide the Sun version as part of the release, Lerman said.

Licensing NEWS

Sun also announced that more than 12 firms and universities have licensed the vendor's proprietary NEWS, including Microsoft Corp., Toshiba America, Inc., Tektronix, Inc., Raster Technologies, Inc., Unicad, Inc. and Acorn Computers Ltd.

Other companies that have endorsed Sun's merging of NEWS and X-Windows Version 11 include Alliant Computer Systems Corp., Applix, Inc., Culler Scientific Systems, Electronic Data Systems Corp. and Floating Point Systems, Inc.

Endorsements also came from Frame Technology Corp., Franz, Inc., Intel Corp, Intellicorp, Interactive Systems Corp., Island Graphics Corp., Lucid, Inc., Microport Systems, Inc., Pyramid Technology Corp., Reasoning Systems, Teknowledge, Inc., Visual Engineering, Inc. and Whitechapel Workstations.

AT&T loses French bid

Sweden's Ericsson wins race for telecom giant

BY AMIEL KORNEL
SPECIAL TO CW

PARIS — The French government announced last week its decision to sell Compagnie Generale des Constructions Telephoniques (CGCT) to a group led by Sweden's L. M. Ericsson AB. The telecommunications equipment maker, previously an affiliate of ITT Corp., has been the object of a hotly contested race that saw leaders in Washington, D.C., and Bonn, West Germany, campaigning for their respective industrial champions.

The decision represents a serious setback to AT&T's efforts to penetrate the European telecommunications market and will likely inflame trade relations between the U.S. and Europe.

The final competing bids came from West Germany's Siemens AG allied with France's Jeumont Schneider SA; APT — AT&T's Netherlands-based subsidiary — and Philips NV allied with France's Societe Anonyme des Telecommunications (SAT); and Ericsson allied with France's electronics firm Matra S.A. and financial partners Bouygues SA and the Indosuez banking group.

The successful bidder is to pay $83 million for the debt-ridden firm, provide $25 million for restructuring and spend an estimated $33 million to adapt its switching equipment to French technical standards.

Penetrating the market

APT, a joint venture of AT&T and Philips NV in the Netherlands, was looking at the CGCT acquisition as a way to penetrate the almost impervious European market for switching systems dominated by national players such as Compagnie Generale d'Electricite in France and Siemens AG in West Germany.

APT, teamed up with the French group SAT, argued throughout the battle that its bid was as European as the rest of the bids.

French privatization laws limit foreign participation of capital to 20%, but it was widely viewed that AT&T would yield management control over APT and slowly increase its capital stake.

"It would be delicate," explained a CGCT official, "after denationalizing CGCT, to put it in the arms of an American."

Kornel is a correspondent for CW Communications International News Service's European bureau.

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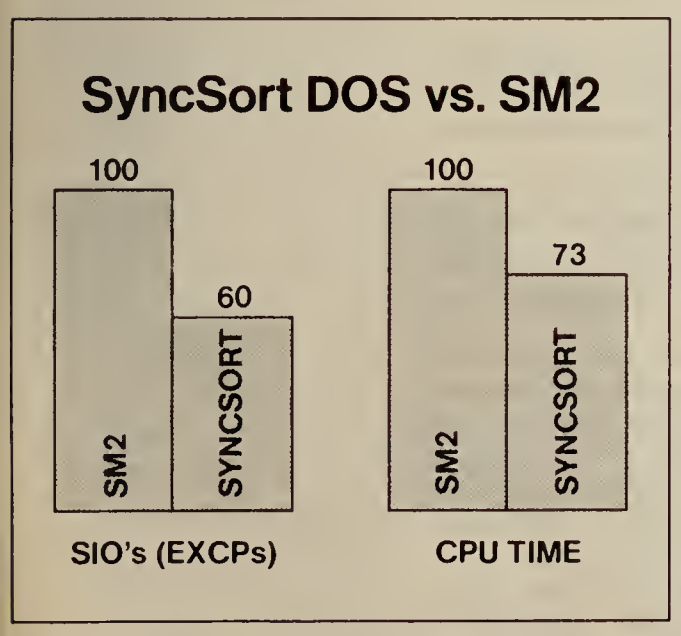

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Prime's 386 system melds Unix, MS-DOS

BY DAVID BRIGHT
CW STAFF

NATICK, Mass. — Departing from its traditional reliance on proprietary processors, minicomputer vendor Prime Computer, Inc. reportedly will introduce tomorrow a multiuser Unix supermicrocomputer system based on the Intel Corp. 80386 microprocessor.

The 32-user EXL 316 system uses Locus Computing Corp.'s Merge 386 environment to run multiple character-mode programs under Microsoft Corp. MS-DOS and AT&T Unix System V Release 3 operating systems simultaneously. Prime officials last week stressed that the system represents a drive for new markets and that it will not compete with the company's 50 series minicomputer line.

"This product will have quite an impact on the company," declared Leonard Halio, vice-president of the Small Systems Products Group. According to Halio, the company expects to increase sales by addressing the growing demand for Unix in government agencies and other office environments. Much of Prime's focus historically has been on scientific and engineering markets.

Prime had previously tried to meet the increased demand for Unix by offering its Primix version of Unix on Prime proprietary processors, "but that didn't seem to be the right thing at the right time," explained John Maske, senior vice-president for corporate operations and programs. Prime realized that the 80386 would provide better price/performance in low-end systems than proprietary processors would, he said.

Halio said that the EXL 316, which can function as a file and print server as well as a departmental system, is built almost entirely on industry-standard hardware and software. In addition to supporting the Unix and MS-DOS operating systems, the system is built around the 32-bit Intel Corp. Multibus II, supports the Ethernet local-area network and uses a small computer systems interface controller. Systems with those features are slated to be available in June.

Consultant Judith Hurwitz of Patricia Seybold's Office Computing Group in Boston said Prime's adherence to industry standards and its solid reputation as a supplier of multiuser systems may give it an advantage over some of the competition. "Prime can stand on its own in terms of technology as well as its already established market presence and its relationship with value-added resellers," she stated.

The EXL 316 will be competing not only against multiuser Unix systems from companies like NCR Corp. and Plexus Computers, Inc. but also against the flood of 80386 multiuser Unix machines that will soon hit the market, Hurwitz added.

According to Halio, the only potential problem is that the compact, floor-standing EXL 316 might be viewed as just a glorified personal computer. "Some people will think of it as a PC with a few extra ports," he said. "It is not. We have designed a large-machine architecture into a very low-cost small-machine configuration."

Because Merge 386 runs MS-DOS as a task under Unix, the two operating systems are smoothly integrated, according to the two companies. For example, the Merge 386 software environment reportedly responds to either Unix or MS-DOS commands, and the system's hard disk drives need not be partitioned to differentiate between the two operating systems.

Prime has contracted with Microsoft to allow MS-DOS to be accessed by multiple users. But users wishing to run MS-DOS programs in a multiuser configuration might have to obtain network license agreements from the suppliers of the programs, a Prime spokesman said. The licensing issue is one reason why Prime decided not to include a floppy disk drive in the new system, he added.

A $23,900 base configuration includes 2M bytes of memory, Unix, a 90M-byte hard drive, a 60M-byte streaming-tape backup subsystem and 10 asynchronous communications lines. The Merge 386 option, including MS-DOS, is priced at $1,800, and the Ethernet option with Transmission Control Protocol/Internet Protocol software is $3,000. A Locus PC Interface for linking PCs to the host costs $1,500 for the host software and $150 for each individual personal computer.

Prime EXL 316

- **Processor:** 16-MHz Intel Corp. 80386
- **System performance:** 3.2 MIPS[1]
- **Operating system:** AT&T Unix System V, Release 3 (optional Merge 386 utility runs Unix and MS-DOS simultaneously)
- **Maximum users supported:** 32
- **System bus:** 32-bit Multibus II
- **Peripheral bus:** Small computer systems interface (1.25M byte/sec. transfer rate)
- **Memory range:** 2M to 8M bytes
- **Hard-disk storage range:** 90M to 1,032M bytes (with second cabinet)
- **Communications options:** Ethernet with TCP/IP[2]
  IBM SNA[3] connectivity (available late this year)
- **Base price[4]:** $23,900
- **Availability:** June

[1] Millions of instructions per second [2] Transmission Control Protocol/Internet Protocol [3] Systems Network Architecture
[4] Includes CPU, operating system, 2M bytes of memory, 90M-byte disk, tape drive, 10 asynchronous lines.

CWCHART

Control Data is finally back in black

After eight consecutive losing quarters, company returns to profitability

BY CLINTON WILDER
CW STAFF

MINNEAPOLIS — In another encouraging first-quarter sign for the computer industry, Control Data Corp. has returned to profitability after eight consecutive quarters in the red.

CDC reported a $6.4 million operating profit and $7.2 million net profit, its best performance since second-quarter 1984. Revenue rose to $821.7 million from $796.1 million a year ago, when the firm lost $21.2 million. Per-share net income was 17 cents, compared with a 52-cent net loss in first-quarter 1986.

If CDC can maintain its momentum, it will mark one of the industry's great turnarounds. On the brink of Chapter 11 of the Federal Bankruptcy Code in 1985 and on the way to a nine-figure loss for the year, CDC was forced to renegotiate credit agreements and execute a massive cost-cutting plan. "We are beginning to see the payoff from operational and financial restructuring, cost-control efforts and, above all, strategic focus," CDC Chairman Robert Price said in a statement.

Price said CDC's computer systems and services group was profitable in the quarter, due to cost reductions implemented in the second half of 1986. The data-storage products group, which accounted for the company's greatest losses during its 1985 fiscal crisis, continued to make "good progress" in reducing costs, according to Price.

Other major vendors reporting quarterly results last week included the following:

Harris Corp. The Melbourne, Fla., maker of computers, office systems and semiconductors noted several encouraging signs as profits rose 43% from year-earlier levels.

Harris earned $21.9 million, or 53 cents per share, in its third fiscal quarter, compared with $15.3 million, or 38 cents per share, a year ago. Revenue grew only marginally from $517.3 million to $522.3 million, reflecting Harris's downsizing program in the past year. President and Chief Executive Officer John T. Hartley said both the information systems and semiconductor sectors were profitable in the quarter, compared with losses in each unit a year ago.

Separately, Harris named 27-year IBM veteran Martin S. Axelrod to head its Fort Lauderdale, Fla.-based computer systems division.

Comdisco, Inc. The Rosemont, Ill.-based lessor's diversification into risk arbitrage paid off handsomely in the quarter, a dramatic change from the previous quarter in which substantial arbitrage losses ate away Comdisco's leasing profits. Before taxes, Comdisco earned more from risk arbitrage ($23.7 million) than from its computer-related business ($23 million). Net income was $28.5 million, or 70 cents per share, a 74% increase from $16.4 million, or 40 cents per share, one year earlier. Revenue rose 27% from $217.6 million to $276.4 million.

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Nomad2 for PC opens windows on mainframe

Microcomputer 4GL offers file transfer to help access host data, develop large-system applications

BY CHARLES BABCOCK
CW STAFF

WILTON, Conn. — A personal computer version of mainframe fourth-generation language Nomad2 incorporates cascading windows and file-transfer capabilities for use in application development on a PC, D&B Computing Services announced today.

PC Nomad employs the same syntax as the mainframe version of the product and includes a series of windowing techniques that help a user access mainframe data or develop applications, according to Abby Pinard, D&B marketing spokesman.

PC Nomad includes basic file-conversion facilities for Lotus Development Corp. 1-2-3 and Data Interchange Format files. The facilities allow spreadsheets and graphics to be integrated into applications without leaving the PC Nomad environment, D&B spokesmen said.

A PC Nomad user starts out in a Command window, in which he enters his first statement, which is subsequently recorded in a History window. A series of statements slated for a new application are recorded in this window and eventually tied together as the new application, Pinard said.

Selections on a systems menu bring up windowing options that enlarge, reduce and zoom in on a particular feature or pan across a window. A windowing command allows the developer to choose standard colors, close or open and execute other basic window configuration tasks.

Beamit capability

PC Nomad works in conjunction with D&B's Beamit on the mainframe for extracting data from Nomad2 data bases and downloading it to Ashton-Tate's Dbase II and Chart-Master, 1-2-3 and six other common PC applications.

Beamit can extract data from IBM VSAM, IMS, SQL/DS and DB2 files. It also works with files in Cullinet Software, Inc.'s IDMS/R and Teradata Corp.'s relational hardware.

Nomad2 and PC Nomad are relational products capable of formulating SQL queries from their syntax and storing data in their own relational data base management systems, D&B officials said. The PC Nomad List command and related keywords allow users to generate reports in a variety of formats. PC Nomad includes an active data dictionary.

PC Nomad retails for $795 per copy and can run on an IBM Personal Computer XT, AT or compatible running IBM's PC-DOS 3.0 with a 10M-byte hard disk and 640K bytes of memory. The product will also run on the IBM Personal System/2 Models 30, 50, 60 and 80, running PC-DOS 3.3.

A $100 runtime version of PC Nomad is available for Nomad applications on IBM PCs. Beamit retails for $5,000, D&B officials said.

The mainframe version of the fourth-generation language is priced from $45,000 to $120,000.

Big Eight

FROM PAGE 1

principal consultant Richard Peterson pegs the growth rate of Big Eight information consulting at 22% to 24% for that same period.

"The MIS department is now about business needs more than technology, and that is really the leg up the Big Eight has," Peterson says. "MIS is worried about how its company is going to make money, and that's what the Big Eight is known for."

Big Eight auditing firms are increasing their computer-related consulting practices with record investments in acquisitions, hiring, research and training. Significant acquisitions recently include Peat, Marwick, Main & Co.'s buyout of strategic information consultant Nolan, Norton & Co., Coopers & Lybrand's acquisition of Walter Ulrich Consulting, Inc. and Deloitte Haskins & Sells' purchase of Holland Systems Corp.

"They have a tremendous advantage," says Gilbert Mintz of Broadview Associates, a software and services industry consulting firm in Fort Lee, N.J. "They may deny a direct correlation between the auditing and consulting sides, but when you are dealing with your own auditing firm, there is a certain relationship and rapport."

"Our people are comfortable dealing with senior management," says Michael Bealmear, national director of information systems in Coopers & Lybrand's management consulting services. "Other services firms may be used to coming in at the level of project leader or DP manager. When senior management wants to be involved in systems decisions, we don't have to make that cultural shift. In a way, the market has come to us."

Dedicated professional services firms such as Computer Task Group, Inc., AGS Computers, Inc. and their smaller regional counterparts have seen some Big Eight impact on their business, as have the service divisions of hardware vendors. But most observers feel that the information systems consulting market is a very large pie that will continue to get bigger.

Conflicts of interest

Big Eight firms are well aware of the potential conflicts of interest, sometimes charged by their competitors, between auditing and systems design. But they strongly deny that their role as auditors compromises their consulting objectivity, and vice versa.

"We don't do much work for our auditing clients, and that's not well understood," says Mel Bergstein, a managing director of Arthur Andersen & Co.'s management information consulting division. "The audit partners know we can make money on our own. They'll only introduce us when it makes sense."

"[The controversy] is nonsense," says Robert Gilges, Peat Marwick's partner in charge of the Nolan Norton consulting business. "Our auditors would never change the way they audit a system, no matter who had designed it. On our side, we have to be even more careful. We don't want to spoil an audit relationship with poor service."

Arthur Andersen is by far the largest Big Eight player in the field, with a staggering total of 9,100 consultants and a client list that includes the MIS operations of IBM. One industry follower has dubbed the Big Eight segment of information consulting "Arthur Andersen and the seven dwarfs." "The auditing side of our business decided to invest in this business even before it made sense," Bergstein says. "Thank God they did."

Bergstein's division will spend $110 million in research and development this year — $60 million in training, $30 million in academic research and prototyping and $20 million on development tools and other software products.

"We don't think the others can make it in this business," Bergstein says. "They got started too late, and this business requires a lot of investment to keep up. Peat Marwick is a distant No. 2 but fighting to catch up and using acquisitions as a tool to do so.

The Big Eight's best marketing advantage is in very large development or planning projects, according to George Rittersbach, a Peat Marwick partner in charge of information systems services. "We won't have the low bid on services priced by the hour," he says. "Large systems development projects are risky by their very nature. Clients want servicers who understand those projects in terms of their overall needs."

Among Peat Marwick's MIS projects are the development of a comprehensive test system for a West Coast utility's customer billing transactions and an analysis of the information flow within a national investment services firm for the next five years. Peat Marwick's information systems service employs about 1,400 consultants worldwide.

At Coopers & Lybrand, custom systems design evolved logically from consulting. "In the mid-1970s, we'd draw up a nice report for a client, and, like most reports, it would sit on an executive's desk," Bealmear says. "Clients were looking for actions, not advice. We had to be more proactive."

Coopers & Lybrand recently became the third member of the Big Eight to join ADAPSO, following Arthur Andersen and Price Waterhouse. The ADAPSO controversy over the potential conflict of interest for Big Eight firms has died down considerably, and ADAPSO says it is actively courting more Big Eight members.

"ADAPSO is no longer focused on that situation," says ADAPSO Executive Director George DeBakey. "We still hear some concerns voiced, but we believe having them as members is very important to our position as representing all the computer services industry."

Big Eight firms are expected to come under scrutiny later this year in hearings before a U.S. Energy and Commerce Subcommittee chaired by Rep. John Dingell (D-Mich.), a noted business watchdog. But the firms' role in technology consulting is not a major priority, according to subcommittee staff members.

Where the profits lie

By most accounts, the auditing business is not a high-growth industry these days. For the Big Eight to grow, their consulting businesses, of which information systems makes up a larger and larger part, must prosper. And that means MIS professionals will be seeing an increasing number of relevant consulting services — everything from systems integration to custom applications development to network management planning — offered by auditing firms.

"Most organizations today recognize that whatever success they will enjoy in the future will be technology-based," says Vito Petruzzelli, a director in the information technology practice at Deloitte Haskins & Sells. "When they discover the need for professional advice for planning that technology, they turn to those people who understand their business. The Big Eight are viewed as something more than auditors; they speak the language of their clients."

"In a way, the Big Eight have been good for the industry," Broadview Associates's Mintz says. "They're good players who set good standards and have convinced more and more MIS clients, without insulting them, that they need help with their planning. It's analogous to the payroll processing industry, which didn't exist before Automatic Data Processing, Inc. The Big Eight are helping to legitimize professional services."

Staking their claims

Recent examples of outright or partial acquisitions by Big Eight firms in computer-related services

Big Eight	*Partner (Description)*	*Type of deal*	*Year*
Price Waterhouse	Management Horizons (On-line processing for wholesale/retail industry)	Acquisition	1985
Coopers & Lybrand	Walter Ulrich Consulting (Communications and DP consulting)	Acquisition	1986
Peat Marwick	Regis McKenna, Inc. (High-tech public relations)	40% equity investment	1986
Peat Marwick	Pittiglio Rabin Todd & McGrath (High-tech manufacturing systems implementation)	40% equity investment	1986
Deloitte Haskins & Sells	Holland Systems Corp. (Information resource planning software and services)	Joint venture/ equity investment	1987
Peat Marwick	Nolan, Norton & Co. (Information systems consulting)	Acquisition	1987
Deloitte Haskins & Sells	Vista Systems, Inc. (Municipal transportation software and consulting)	Acquisition	1987

INFORMATION PROVIDED BY BROADVIEW ASSOCIATES AND INDIVIDUAL FIRMS
CW CHART

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9:00 a.m.	Mayhem stalks the Data Center: Caging the VM Villains
12:30 p.m.	Complimentary lunch

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May 8

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April 3

Chicaga, IL (Downtawn)
May 19

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May 21

Dallas, TX
May 12

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May 20

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April 27

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May 15

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April 9

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April 29

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April 8

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April 21

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DEC terminals retire VT240

VT330, VT340 overpower 4-year-old line, offer dual-session capability

BY NINAMARY BUBA MAGINNIS
CW STAFF

BOSTON — Digital Equipment Corp. last week introduced high-performance terminals that enable users to conduct twin sessions over single or dual communication lines.

The monochrome VT330 and color VT340 text and graphics terminals will replace the VT240 and VT241 terminals that were announced in 1983, said Jeffrey C. Kalb, DEC vice-president and group manager of low-end systems and technologies. More than 100,000 VT240 series terminals are installed in the U.S., according to International Data Corp. (IDC), a Framingham, Mass.-based research firm.

The new terminals, which run up to five times faster than their predecessors, are fully compatible with DEC's VAX computing architecture, support DEC's Regis and Sixels graphics protocols and provide VT52, VT100, VT240, VT241 and Tektronix, Inc. 4010 and 4014 emulation, the vendor said. The Regis protocol is enhanced with 7-bit national replacement character set and 8-bit multinational character support to accommodate all European languages.

Dual sessions can be seen simultaneously on a split screen that divides either horizontally or vertically. A flip-screen mode allows users to move back and forth between sessions with a session switch. "There is no need for host intervention and no need for host application software," Kalb said.

With the optional software for the session support utility, a layered VAX/VMS product, users can conduct dual sessions from DEC and non-DEC systems — including IBM mainframes — over a single existing wire, he added.

To connect to an IBM mainframe, the request from the terminal is sent to the terminal server, which forwards the message to the VAX. From the VAX, the request is routed through the IBM Systems Network Architecture (SNA) gateway to the mainframe. The IBM response is then sent back to the VAX through the VAX SNA gateway, to the terminal server and, finally, to the VT300 series terminal, the vendor said.

The session support utility base license costs $200. Proprietary firmware that enables the utility capability on the terminal side comes standard with the 300 series products.

Another proprietary feature is the high-performance graphics chips set that is used in DEC's Vaxstation II/GPX workstations and is built into the 300 series terminals for faster drawing speeds, the vendor claimed. The new terminals support either a mouse or graphics tablet, giving them workstation-like capabilities, the vendor said.

The Hamilton Standard Division of United Technologies Corp. evaluated two 300 series terminals during the past seven weeks and has placed an order for several hundred, said Pearce Healy, MIS director for the Windsor Locks, Conn.-based division.

Hamilton Standard has several VAX 8700s and VT240s installed, Healy said. The new terminals, promised to Hamilton Standard in 30 days, are part of the firm's expansion plans for its electrical design and analysis engineering department, he reported.

Healy cited the simultaneous

Continued on page 9

CSP deflects

FROM PAGE 1

generation language, Cross System Product, shows early signs of doing the same to fourth-generation languages," a Paine Webber, Inc. market research report concluded.

The pattern of the early releases of CSP match those of DB2. "Severe functionality flaws, good performance and solid-seeming underlying design," the report said.

It was Version 3, announced Sept. 8, 1986, that moved CSP forward as a contender in the realm of fourth-generation languages. Version 3 extended support to DB2, SQL/DS and MVS/XA, provided structured programming controls and added a batch-execution facility.

Though few users take advantage of the capability, a CSP application can run in any of the following environments: CICS/VS, MVS/TSO, VM/CMS, Small System Executive (SSX)/VSE, 5668-825 and 8100/Distributed Processing Programming Executive.

In addition, a CSP application can run under PC-DOS or IBM's new Operating System/2 through the use of two products, Easy Prep and Easy Run, that convert CSP to a PC-DOS application. CSP applications still cannot be developed on a personal computer, however.

Calming the critics

Even so, Version 3 did not silence all of CSP's critics.

Shaku Atre of Atre International Consultants, Inc., a fourth-generation language and information center consultant, said, "IBM went to the closet looking for something it could call a fourth-generation language and came up with CSP." It originated as a development language for the 8100 processor prior to being refurbished as a 370-family product in 1982. "It's too cryptic; it's for techies," she declared.

Another doubter is John B. Landry, author of the ADAPSO report on software development technology and chairman of Distribution Management Systems, Inc., who said that for all IBM's talk of a strategic product, it has not developed any applications of its own in CSP. IBM said it developed CSP applications for internal use and has some under development as products. Landry charged that CSP's price of $42,000 to $60,000 is too high for it to catch on as a software development environment.

"At this point, I can't figure out what the strategic fit of CSP is," Landry said.

However, one user, Brown Group, Inc., a St. Louis-based, shoe manufacturer, has staked its future on it. "We've used Focus and other fourth-generation languages. But CSP is the only one you can use for production applications with DB2," said George Merkle, Brown Group's director of information technologies.

A spokesman for a large New York bank echoed the remark. "DB2 is our primary data base management system. We use CSP for our MVS/CICS production applications."

New production applications are being done in CSP as a substitute for CICS Cobol, the spokesman said. The bank officer asked that he remain unidentified.

Even enthusiastic users cited a common problem, however. Once a CSP application has been generated, it must be stored in a CSP library rather than in an MVS partitioned data set in which change controls are enforced on other production applications.

"That is a critical problem. We have our whole system set up for controlling libraries in partitioned data sets. The library structure in CSP is all VSAM files," said a representative of a large New York insurance company that evaluated CSP and then dropped it for that reason.

Kay Mowery, IBM product manager for CSP, said the development language provides utilities for managing production code in its own libraries. "We have not seen that as a significant problem in most of our user shops," he said.

One experienced user of several fourth-generation languages has chosen CSP as its language for prototyping new products. David A. Duffield, chairman of Integral Systems, a Walnut Creek, Calif-based producer of human resource applications, redeveloped payroll and personnel applications in CSP after producing versions in Software AG of North America, Inc.'s Natural; Applied Data Research, Inc.'s Ideal and Cullinet Software, Inc.'s Ads/Online.

Duffield said a CSP application has the advantage over other fourth-generation languages in being able to run multiple customer environments. Also, his development staff prefers working in it.

He said it is easy to construct screens with CSP's mapping facility. CSP checks the syntax of a line of code as soon as it is entered and highlights an error.

CSP establishes an individual library for a programmer but gives him read-only access to five other libraries. One or more libraries can be devoted to common routines, so that a team working on a project can share routines, Duffield said.

"It's not as elegant as Ideal. It looks more like a combination of Basic and Cobol," he remarked.

Programmers can run programs or parts of programs interactively without requiring their work to be recompiled for each test run, he noted.

CSP is an interpretive language with what Brown Group's Merkle termed a "dynamic bind and test" for development and a static, or higher level, interpretation for production versions. The latter runs more efficiently than those of other fourth-generation languages, Duffield said.

IBM's Mowery said users should expect CSP performance to fall somewhere in between existing fourth-generation languages and Cobol.

Landry said CSP's style of coding is similar to using a procedural language and "very close to Cobol. You're not getting a lot of bang for the buck." IBM product manager Mowery said Landry's assessment was "too simplified a comparison."

Landry said the coding productivity gain with CSP was 2-to-1 against Cobol, compared with a standard fourth-generation language gain of 10-to-1.

Merkle criticized the eight-character naming limit in CSP.

The spokesman for the New York insurance company that reviewed and rejected CSP said that IBM warned the firm that it should expect some performance degradation as the number of of users increased. "It's a big memory eater," Landry said.

"It bogs down from contention when you get more than a handful of programmers working with it. We have as few working as possible," Duffield said.

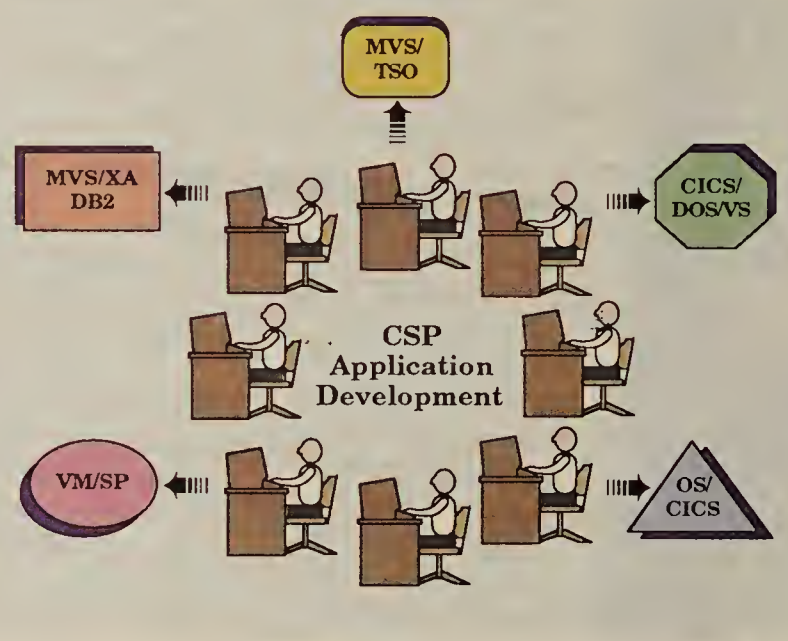
Another criticism of CSP is that it highlights one error at a time, even when there are multiple errors on a screen or in a line of code. Mowery said IBM is reconsidering its approach to error highlighting.

Mowery also said IBM may have inadvertently cast doubt on CSP's future in the wording of its Systems Application Architecture announcement on March 17. While naming SQL and C as standards for future application development, the announcement referred to an application generator "based on elements of the interfaces found in the existing CSP."

"The intent is to commit a very sizable piece of the CSP programming interface as part of SSA. It's still a strategic product," Mowery said.

"We feel CSP is relatively undiscovered, like DB2 once was. Seventy percent of our customers have not heard of it," Integral System's Duffield added.

CSP
Working in multiple IBM environments



CW CHART: SUSAN ALDAM

Competitors shrug off DEC 300 series intros

BY NINAMARY BUBA MAGINNIS
CW STAFF

Developers of terminals that are compatible with Digital Equipment Corp.'s VT240 line said last week that the new DEC terminals offer few benefits over their existing products.

"We believe we're already a match for the 300 series," said Michael Kantrowitz, marketing director at Human Designed Systems, Inc. in Philadelphia. "DEC hasn't really changed the price/performance curve in the graphics terminal marketplace. That doesn't mean we won't offer VT330 emulation mode, but it doesn't mean we'll significantly change, either."

Kantrowitz said Human Designed Systems, which sells the HDS2200GX, has offered twin sessions for more than eight years.

The Human Designed Systems VT240-compatible terminal lists for $1,595 and includes 1,056- by 800-pixel resolution, about 50% more than that offered by DEC's new VT330 terminal, Kantrowitz observed.

Wilsonville, Ore.-based Tektronix, Inc. does not plan to clone DEC's 300 series terminals because its own 4100 and 4200 series graphics standard fills the bill, said Julie Nelson, Tektronix product manager of the 4205 and 4207 graphics terminals.

Tektronix offers graphics terminals with emulation to DEC's alphanumeric VT100 and VT220 terminals, Nelson said. The Tektronix terminals allow two independent sessions with alphanumeric applications independent from graphics. Because the terminals also emulate IBM's 3270 terminal and the IBM Graphical Data Display Manager graphics standard, Tektronix users can link directly to IBM mainframes, Nelson noted, adding that the Tektronix 4205 terminal lists at $2,495.

St. Louis-based Micro-Term, Inc. offers a VT240-compatible Model 440 terminal that lists at $1,495 and offers significant performance and price advantages over both the VT240 and the VT330, claimed Dennis O'Donnell, Micro-Term's executive vice-president. He said the Model 440 is seven to 10 times faster than DEC's VT240.

Micro-Term had been waiting for DEC to announce the high-performance terminals, O'Donnell reported. "In terms of a color market, we will be a participant, rest assured," he said.

Micro-Term plans to announce dual-session capability within six months, according to O'Donnell, who claimed there is no applications software on the market to take advantage of it.

DEC terminals

CONTINUED FROM PAGE 8

sessions from two separate CPUs and the price reduction from the older 200 series terminals as important reasons for making the purchase.

Diane Farrell, a senior research analyst for IDC, commented, "The product itself is significant because it comes from DEC, and DEC controls a large portion of the terminal market and a large portion of the low-end graphics terminal market.

Some new features, such as the 14-in. screen, tilt-and-swivel display and nonvolatile function keys, are already standard in the industry, Farrell observed. "They had to play catch-up to the rest of the people in the market," she added.

The new terminals are targeted for engineering, manufacturing, insurance, finance, education, transportation, government and utilities markets.

Unburdening the host

To unburden the host computer, the VT300 terminals can reportedly store up to six screens of text or two full screens of graphics in resident memory. In dual-session mode, up to three text screens per session can be stored in main memory.

The VT340's built-in color graphics editor gives users a choice of 16 colors from a palette of 4,096. While the current DEC LCP01 color printer cannot print the variety of colors on the screen, the vendor will soon announce a full-color printer capable of reproducing colors on paper as they appear on the screen, according to sources close to DEC.

Communication speeds can be 75, 110, 150, 300, 600, 1,200, 2,400, 4,800, 9.6K and 19.2K bit/sec., depending on user requirements.

Both 300 series terminals provide resolution of 800 by 500 pixels, twice the resolution of the VT200 series, DEC said. The screens can display characters in a dense 10- by 20-dot matrix that appears as letter quality in both 80- and 132-col. modes, the vendor claimed.

The DEC terminals are expensive when compared with VT240- and VT241-compatible third-party terminal offerings from such firms as Tektronix, Human Designed Systems, Inc., Visual Technology, Inc. and Micro-Term, Inc., IDC's Farrell said.

The monochrome VT330 lists at $1,895 and costs $300 less than the retired VT240. The VT340 costs $2,795 and is $400 less than the VT241. Both terminals come with a one-year on-site warranty.

MSA to widen scope of Info Expert

VAX, portable versions planned for 4GL-based system

BY ROSEMARY HAMILTON
CW STAFF

ATLANTA — Management Science America, Inc. (MSA) announced its intention last week to move its Information Expert development environment beyond the IBM mainframe world to a series of other hardware platforms, including Digital Equipment Corp. VAXs and personal computers.

A portable version of Information Expert is under development that allows the system to run on various hardware platforms, according to Philip Ross, an MSA vice-president attending the company's Interact meeting held here last week. The current software was written in assembler language to attain maximum performance on IBM mainframes, he said.

MSA is currently negotiating with DEC to port the software to the VAX environment. "DEC has no pieces yet," Ross said in reference to the Information Expert components, "but I'd love to see it happen this year."

Meanwhile, MSA is also involved in development projects with NCR Corp., Unisys Corp. and Honeywell Bull, Inc. to rewrite a portable version using Cobol and C. "I don't know the delivery date, but a rough one would be within this year," Ross said. While MSA is involved with the rewrites, hardware vendors will sell the software to their customer bases, he said.

Ross also said a version of one component, a screen painting facility, is running on a microcomputer at MSA. "We have a direction for PCs," he said, "but our plans now are still more focused on mainframes."

The announcement comes at a time when the Information Expert is enjoying a swell of support from MSA's customer base. Users interviewed last week gave the product high marks, even though most also said that the software still has its flaws.

Ross said MSA received 800 orders for the latest release of the product in just three week's time. Release 87.01, which includes the first release of the system security program, was made generally available April 1.

Information Expert, first introduced in 1985, is a fourth-generation language-based development environment made up of a data dictionary and a series of tools. Some of those tools are now available, such as the Expert Retrieval and Reporting component that allows users to generate reports with simplified, menu-driven procedures. Other components, such as a screen painting utility not included in the recent release, are now in beta-test sites. Also in beta test is a new version of the query tool slated for the next release. A new version of the Expert Link component, designed to download information to microcomputers, is scheduled to go out to beta sites within two months, the vendor said.

"There's no question that the basic concepts are good, and, as the bugs are ironed out, it'll become a very good product," said Timothy Latimer, a systems analyst for Communications Satellite Corp. in Washington, D.C.

MSA designed the software to run on IBM mainframes and to work with MSA application packages as well as data base management systems. Extended-use versions of Information Expert tools are available for users who wish to include their applications designed in-house or other vendor's applications in the Information Expert environment.

Fine-tuning still needed

Long before a personal computer version debuts, the current version still needs fine-tuning.

"MSA has been fulfilling its promises, but we haven't received the ultimate yet," said David Manigault, financial systems coordinator at Twin County Grocers, Inc. in Edison, N.J.

Manigault, who has been using Information Expert tools since early 1986, said there were "the usual bugs" with the system. For instance, he said, "there was some glitch with Information Expert and our CICS where screen aborts would occasionally happen."

"You expect problems, and there were quite a few," said Kenneth Mathis, senior systems analyst at Unijax, Inc., a Jacksonville, Fla.-based distributor of paper products. "But it's a good language, and it's easy to train users. We hope to one day use it exclusively."

The fact that users are positive about Information Expert, despite its flaws, is a bonus for MSA. The company has actually been giving away the components since introducing the system two years ago. Today, the company claims to have 2,600 Information Expert licenses.

But the bulk of those users automatically received the components when they ordered an MSA applications package.

Since 1985, 300 users have plunked down the $50,000 fee for the extended version that would allow them to use the system with non-MSA applications.

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Trevose ..... Jun 30
SC Columbia ..... Apr 7
TN Nashville ..... Apr 9
TX Amarillo ..... Apr 7
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Alliant widens FX net, graphics support

BY DONNA RAIMONDI
CW STAFF

LITTLETON, Mass. — Alliant Computer Systems Corp. is scheduled this week to release a spate of networking and graphics products that tie its FX/Series supercomputers more closely to Digital Equipment Corp., IBM and Cray Research, Inc. systems and provide improved graphics output.

The new components of the networking product line, Alliant Network Supercomputing Resources, will be released by the end of the third quarter, Alliant said.

Alliant, which claims 110 installations of its Unix-based parallel processing systems, will tie the FX/Series into DEC environments through an implementation of DEC's Decnet based upon Community from Technology Concepts, Inc. in Sudbury, Mass.

With the Decnet compatibility, DEC systems, as well as IBM Personal Computers and compatibles, can log in remotely, transfer files and run program-to-program communication applications on Ethernet. The package costs $8,000 for the FX/1 and $14,000 for the FX/8.

In addition, Alliant has developed an emulation package for DEC's VAX/VMS Digital Command Language (DCL). The emulation package allows DCL commands to be used to interact with Alliant's Unix-based system. It is priced at $6,000 on the FX/1 and $10,000 on the FX/8. A $995 emulator of the VAX EDT editor is also offered.

"Our customers are typically those who have used VAXs for many years and are now running out of gas," said Phil Neray, product manager for networking and graphics at Alliant. "They want something that can be integrated quickly into their existing environments."

Alliant will also support Network Systems Corp.'s Hyperchannel high-speed network, which will allow the FX/Series to function as interactive development and preprocessing environments for back-end Cray supercomputers, with data exchange at 50M bit/sec. Hyperchannel support will be priced at $14,000.

Packet-switched networks using the CCITT X.25 standard and the Defense Data Network (DDN) protocols will be able to interactively access the FX/Series when that support is available in the third quarter. The support option costs $7,500 for X.25 and $10,000 for DDN.

Support of IBM's HASP protocol will now allow FX/Series models to be connected to IBM mainframes. An intelligent communications processor is used to offload protocol processing from Alliant processors. HASP support costs $6,000. Synchronous communications modules are available for use with X.25, DDN and HASP support. The modules are priced at $7,620.

Alliant will also support two interactive network graphics packages for Unix-based systems: MIT's X-Windows and Sun Microsystems, Inc.'s Network Extensible Window System. Support for both standards will be built into the FX/Series Concentrix operating system and will not be priced separately.

The firm also announced support for a suite of graphics packages developed by Precision Visuals, Inc. in Boulder, Colo. They include the Siggraph Core-based DI-3000 and the American National Standards Institute -standard Graphics Kernel System-based GK-2000 package.

System freedom

The networking and graphics announcements are a major step in Alliant's strategic direction to build parallel processing systems that can function as servers for large numbers of workstations and scientific computers, leaving those systems free for less compute-intensive tasks, said Ron Gruner, president of Alliant.

"You can put up to eight 8600-class processors in the same box and have them operating in parallel. Then on top of that, you can put up to 12 interactive processors which are Motorola, Inc. 68020 based," Alliant's Neray noted. "The result is you can be running compute-intensive jobs on the larger processors while, at the same time, running network protocols or DCL emulation software on the interactive processors."

The Alliant line features a parallel optimizing compiler that restructures existing Fortran code to run on parallel processors.

For FX/8 user Thomas Stephenson, manager of advanced computing technology at The Analytic Sciences Corp. in Reading, Mass., the announcement has immediate and far-reaching implications.

"We have VAXs running VMS and IBM mainframes," he said. "The ability for us to freely migrate from one to another when appropriate is very important."

Formed in 1982 by ex-Data General Corp. employees Gruner and Craig Mundie, Alliant has been on a rapid growth curve during the past year. Its 1986 year-end revenue soared nearly 600% to $30.7 million. First-quarter results released last week showed revenue of $12 million, three times greater than the first quarter 1986 but just slightly below fourth-quarter revenue; profits, excluding a tax credit, were $1.6 million, compared with $249,000 a year earlier.

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3317-8717

Laptop market hit head-on by import tariff

BY MITCH BETTS
CW STAFF

The U.S. decision to slap 100% tariffs on imported Japanese micros is a major setback for Toshiba America, Inc.'s fast-selling laptops and could pose problems for other importers if the sanctions last several months.

Many firms affected by the tariffs said they have sufficient inventories in the U.S. to last a few weeks, but hinted they would have to raise prices or stop importing if the sanctions last longer. Some importers said they plan to shift their manufacturing operations to the U.S. to escape the problem.

Toshiba, however, already has stopped importing the popular T-3100 laptop from its parent, Toshiba Machine Co. in Japan, according to Nobuo Ishizaka, chairman and chief executive officer of Toshiba America. He said the tariff doubles the product's price and makes it uncompetitive.

Toshiba's action could help sales of competing laptop and portable micros offered by Compaq Computer Corp., Tandy Corp., Zenith Data Systems Corp. and IBM, analysts said.

Bill Kirwin, an analyst for the Gartner Group, Inc. in Stamford, Conn., said the Toshiba laptops are feature-rich and have proven successful in the marketplace. "But Zenith and Compaq are ready, willing and able to jump right in there and take that share," he said.

Toshiba's T-3100 accounts for about 20% of U.S. laptop sales so far this year, according to Raymond Falls, an analyst for Datapro Research Corp. He said that about 80,000 Toshiba units have been sold this year, out of a total of 400,000 laptops sold so far this year.

The Reagan administration announced the tariffs in retaliation against Japan's alleged failure to enforce the U.S. Semiconductor Trade Agreement negotiated last year [CW, April 20]. The trade sanctions became effective April 17 and will be lifted once the U.S. gathers statistics showing that the semiconductor trade situation has improved.

Optimists hope the trade dispute can be resolved during Japanese Prime Minister Yasuhiro Nakasone's visit to the U.S. this week, but some U.S. officials have said it will take about three months for the Japanese to show significant improvement.

Tried to minimize effect

The tariffs cover 16-bit microcomputers imported from Japan, a total market worth about $180 million, as well as power tools and color televisions. The Reagan administration said it selected product categories that have domestic or other foreign suppliers to minimize the effect on U.S. consumers.

One of the affected vendors, NEC Home Electronics, Inc. in Wood Dale, Ill., plans to continue importing its Multispeed laptops and APC desktop micros from Japan but eventually will be forced to raise prices, according to Marion Black-Ruffin, manager of marketing communications.

"We're investigating ways to reduce our manufacturing costs in order to keep any price increases to a bare minimum. We're lucky enough to have inventory available at our current pricing, so we won't have to impose any price increases . . . for a few weeks," she said.

The tariffs could have been a major setback for Epson America, Inc.'s Equity line of personal computers — which have roughly 5% of the U.S. market for PCs — but Epson apparently saw the tariffs coming and took evasive action.

Andrew Leonard, Epson's director of corporate planning and communications, said the firm imported enough stock prior to the April 17 announcement to last two or three months.

Toshiba's decision to stop importing the T-3100 creates a small problem for Grid Systems Corp. in Mountain View, Calif., which announced April 13 that it would sell a version of the Toshiba laptop called the Grid 286.

"We just introduced it. We haven't gotten rolling on the thing yet, so the impact for our overall business and product line is not significant at this point," said Ed Murphy, Grid's marketing manager. In fact, the tariffs on Japanese laptops could have a positive effect for the bulk of Grid's product line, which is manufactured in the U.S., he said.

Also affected is Wang Laboratories, Inc. in Lowell, Mass., whose laptop is manufactured in Japan by Brother Industries, Ltd. "We feel we have enough of an inventory in the U.S. already to meet current customer demand at current prices for the immediate future," said spokesman Paul Henning.

Dan Infanti, manager of corporate marketing for Sharp Electronics Corp. in Paramus, N.J., said Sharp's three PC models are covered by the tariffs. "If it's resolved over a period of weeks,

Continued on page 18

Japan: Tariff plan 'defies logic'

The Electronic Industries Association of Japan (EIAJ) denounced the U.S. trade sanctions as premature and said the decision "defies logic" because it applies tariffs to Japanese products other than semiconductors, the product at the center of the U.S.-Japan trade dispute.

U.S. officials said the tariffs were applied to Japanese microcomputers and other electronics products, rather than chips, to avoid harming U.S. firms that depend on Japanese chips for their products.

The trade dispute concerns the U.S.-Japan Semiconductor Trade Agreement signed in September 1986. The U.S. government charges that Japan has failed to live up to two parts of the agreement: to stop selling chips at below-cost prices in foreign markets and to open the Japanese market to U.S. chip suppliers.

The U.S. contends that Japan has shown no progress on either front, thus jeopardizing the health of the U.S. semiconductor industry. Japan claims the U.S. is expecting results too soon and is ignoring its reform efforts.

"It is regrettable that the U.S. government is not allowing sufficient time for these results to become apparent before making this premature decision," said Shoichi Saba, chairman of the EIAJ, in a statement.

The U.S. action was praised by the U.S.-based Semiconductor Industry Association.

Shortly after the Reagan administration rebuffed last-minute pleas from Japan and invoked the tariffs, the Japanese government announced it would take the dispute to the General Agreement on Tariffs and Trade, the international compact that regulates world trade.

MITCH BETTS

Memorex joins 3480 tape drive battle

BY JAMES CONNOLLY
CW STAFF

MILPITAS, Calif. — Memorex Corp. is scheduled to make its entry into the IBM 3480-compatible cartridge tape drive market tomorrow with a drive and controller that are priced the same as IBM's but contain the bundling of 750 tape cartridges with each dual-transport drive.

The announcement will be the first major storage product introduction since Unisys Corp. sold its Memorex subsidiary to a group of Memorex executives last fall, although the company said more storage and terminal announcements are due during the next two months. Memorex officials said the transition to a stand-alone company is almost complete, and they expect to generate $1 billion in revenue in the fiscal year ending November 30.

The Memorex 5480 is scheduled to be shipped during the third quarter. Memorex product marketing manager Henry J. Czeranko noted that although IBM delivered its first 3480s more than two years ago, the start-up time is lengthy for any plug-compatible manufacturer (PCM) tape product and that those products have long life cycles. "I don't think we are late. We're not the first PCM to announce, but I don't think there will be a whole lot shipping before summer," Czeranko said.

Unlike PCM competitor Storage Technology Corp., Memorex is not announcing an automated library feature for its 3480-compatible drive. John C. Scott, Memorex vice-president for marketing, said the company is unsure what type of library feature it eventually will offer.

The 5480 is made in Japan for Memorex by Fujitsu Ltd. The product is functionally similar to IBM's 3480 except that the Memorex product supports eight channels rather than four and includes features such as a larger buffer and larger display. A maximum configuration supports two controllers, 16 channels and eight drive subsystems, each with two tape transports.

But while the IBM and Memorex products are similar, Memorex is emphasizing its added value, better product reliability and the ability to supply its 1-year-old Toughshell 3480-compatible cartridges.

Czeranko said Memorex retains a price advantage against IBM by bundling those cartridges with its tape systems. The minimum configuration, consisting of a control unit, a dual-drive unit and 750 cartridges, costs $108,550. A maximum configuration with two controllers, eight dual-drive modules, 6,000 cartridges and a two-controller switch, costs $479,550.

Low-priced laser printer hits market

BY ALAN ALPER
CW STAFF

NEW YORK — Setting a new entry-level price point for Hewlett-Packard Co. Laserjet Plus emulation, C. Itoh Digital Products, Inc. last week unveiled a 5 page/min laser printer listing for $1,795.

Aimed at personal or small departmental usage, C. Itoh's Jet-Setter comes with 512K bytes of memory, which enables it to accommodate applications requiring the integration of text and graphics, and features 300 dot/in. resolution. The laser printer will be available through C. Itoh's top 550 resellers beginning in July, noted Frank Rexach, product marketing manager, who said the firm is offering margins in excess of 40%.

Jet-Setter's list price of $1,795 is $700 less than the list price of HP's Laserjet, which operates at 8 page/min and is $100 less than QMS, Inc.'s low-end laser printer, Kiss. Okidata offers a low-end laser priced at $1,795, but it requires 120K bytes of additional memory and an add-in module to be compatible with the Laserjet Plus, modifications that jack its price up to $2,295, Rexach said.

"They're definitely the price leader," noted Charles LeCompte, editor of the "Printout Newsletter," referring to C. Itoh. "It's just a question, though, of how long it lasts."

LeCompte said that Okidata is expected to reduce the price of its laser printer with Laserjet Plus emulation to less than $2,000, while some HP dealers are already offering the Laserjet Plus at about $1,795.

C. Itoh said it is aiming its initial printer at low-volume print environments where users are running standard business applications. .

"The 6 to 10 page/min market is well-saturated," Rexach said. "We're aiming our product at the general-business user who uses a dot matrix or a daisywheel printer and is interested in getting in on the laser revolution."

The printer comes standard with Centronics Data Computer Corp. parallel, RS-232C serial and RS-422 interfaces. List price includes toner, users manual and a one-year warranty.

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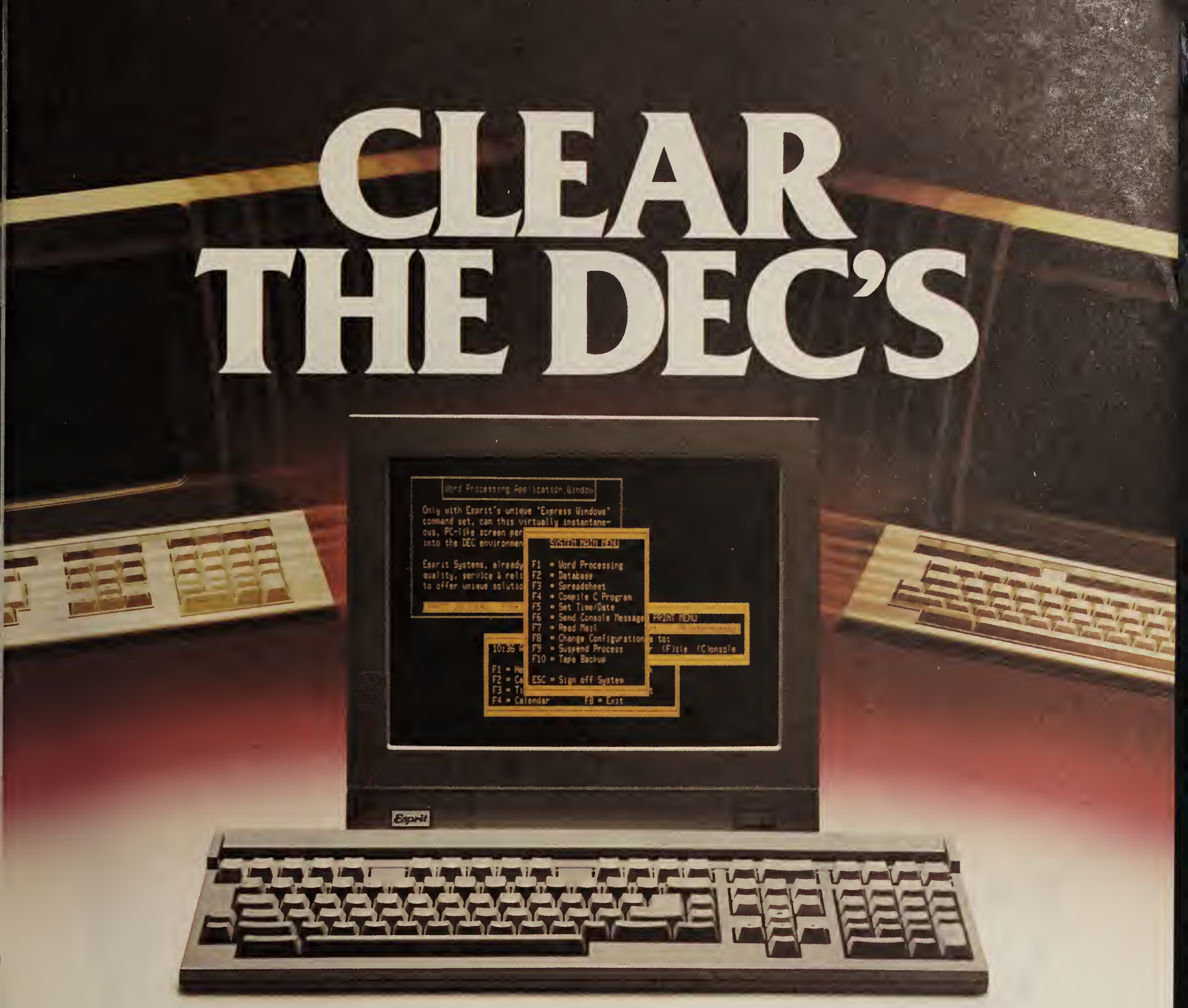

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NETWORKING

AT&T joins PC compatible price cut parade

BY ALAN ALPER
CW STAFF

MORRISTOWN, N.J. — Responding to changing market conditions, AT&T last week slashed prices up to 38% on its line of IBM Personal Computer-compatible micros.

AT&T thus joins Hewlett-Packard Co. and Epson America, Inc. in cutting price tags in response to IBM's price reductions on selected models of its PC family [CW, April 20].

AT&T said the price reductions are in response to market trends and are aimed at reconfirming the company's commitment to remain competitive in the PC marketplace.

The steepest reductions were made on the 80286-based PC 6300 Plus line, as AT&T cut prices between 27% and 38%. The single-floppy-disk model lists for $1,590; the dual-floppy unit costs $1,740; the 20M-byte hard-disk, 360K-byte model is priced at $2,240; the 20M-byte hard-disk, 1.2M-byte floppy unit lists for $2,340; and the 40M-byte hard-disk, 1.2M-byte floppy system now costs $3,065.

Tom Roberts, an analyst with International Data Corp., a Framingham, Mass.-based market research firm, said the drastic price cuts on the 6300 Plus line indicate that AT&T may be withdrawing the product from the market.

The system, he pointed out, has not enjoyed overwhelming success, primarily because it cannot accept standard 16-bit PC AT-compatible boards and does not use a standard monitor adapter.

"It appears as if they are clearing out inventory on the product," Roberts said. "It probably will be replaced by the 6310."

The price cuts on the 6300 family, he said, align AT&T's prices on low-end PCs with the rest of the industry. "They're treating PCs as if they're a commodity," Roberts commented.

AT&T cut prices by between 17% and 23% on its PC 6300 line. List prices for the product family are $1,485, $1,565 and $2,165 for the single-floppy, dual-floppy and 20M-byte hard-disk models, respectively.

Prices for the 6310 family were reduced by about 5%. List prices for the product line are $2,900, $3,800 and $4,700 for the 1.2M-byte floppy, 20M-byte hard-disk; 1.2M-byte floppy and 40M-byte hard-disk; and 1.2M-byte versions, respectively.

AT&T did not reduce prices on various options such as keyboards, monitors and display boards.

In addition, the firm is extending its warranty period for the PC 6300 line and associated peripherals from three months to one year. AT&T already offers a one-year warranty on its other microcomputers.

Laptop

FROM PAGE 13

it'll just be business as usual. If it goes on for months and months, then you jeopardize your sales network," Infanti commented.

Tariff exemptions

Data General Corp.'s DG/1 laptop, manufactured by Nippon-Data General Corp. in Japan, is exempt from the tariff because it uses Intel Corp.'s 80C88 chip, according to Ed Russell, spokesman for the Westboro, Mass.-based firm.

The U.S. Department of Commerce informed DG that the tariff applies only to laptops with the Intel 80286 and 8086 chips but not the 80C88, Russell said.

Likewise, the Z-181 laptop sold by Zenith Data Systems, a unit of Zenith Electronics Corp. in Glenview, Ill., also is exempt, even though it is made in Japan by Sanyo Electric Ltd.

Zenith spokesman Glen Nelson said the Z-181 uses the 80C88 chip, which acts as an 8-bit chip.

Multiflow rolls out minisupers

BY ALAN ALPER
CW STAFF

NEW YORK — Offering a less expensive approach to high-speed computing that leverages unconventional technologies on a single processor, Multiflow Computer, Inc. last week officially unveiled its family of Unix-based minisupercomputers.

Multiflow's Trace family of computers — priced between $300,000 and $1 million and aimed initially at the scientific and engineering marketplace — makes use of very long instruction word architecture and a compacting compiler. The approach reportedly allows Trace to pack an instruction word up to 1,024 bits wide, enabling as many as 28 operations to be executed simultaneously.

Other computer manufacturers have used a variety of methods to achieve high-speed processing. Firms like IBM and Cray Research, Inc. are using faster circuits, which is inherently expensive, noted Joseph A. Fisher, a Multiflow cofounder and executive vice-president. A host of other vendors are using multiprocessing or parallel processing. This only accelerates the processing of compute-intensive code, which can be vectorized, but does not speed up the scalar processing of support code, Fisher said.

Multiflow's method uses overlapping execution to speed up the processing of both compute-intensive and support code, Fisher said. "Users can now get a speed up whether an application is dominated by either type of subroutine," he noted.

Multiflow's compiler, called Trace Scheduling, gets around conditional jumps, a problem associated with overlapped executions. It picks the most probable path that the code will take and adds compensation code for those lines that do not follow. The code is then compacted into very long instruction word architecture.

All applications written in C or Fortran will run on Trace, Fisher said, which enables the system to be dropped into an existing computing environment without rewriting any code.

The three-member family runs an enhanced version of University of California at Berkeley Unix 4.3 on conventional hardware using the VME I/O bus. The systems support a variety of connectivity alternatives including Ethernet, TCP/IP, Sun Microsystems, Inc. Network File System and Decnet.

The Trace 7/200 packs seven operations into one 256-bit instruction and will be available in July, noted Robert Smith, vice-president of sales and marketing. The Trace 7/200 is priced at $299,500 and includes 16M bytes of main memory, expandable to 512M bytes; VME I/O processor; a disk controller and 515M bytes of Winchester disk storage and a cartridge tape drive.

The Trace 14/200 will process 512-bit words and execute 14 operations simultaneously, while the Trace 28/200 will process 1.024-bit words and 28 operations simultaneously, Multiflow said.

The firm said the systems will debut in the fourth quarter. Smith declined to provide projected pricing or specify the delivery dates of either system.

Initial beta-test users include United Technologies Corp.'s Sikorsky Aircraft division in Stratford, Conn., and Grumman Corp.'s Data System division in Woodbury, N.Y.

Multiflow will most closely compete with minisupercomputer vendors Convex Computer Corp. and Alliant Computer Systems Corp.

Dataquest, Inc., the San Jose, Calif., market research firm, predicted the combined market for supermini, minisuper and supercomputers will grow from $6 billion last year to about $14.5 billion by 1990. Based on the benchmark results, which show the Trace/200 operating at about 28 million instructions per second (MIPS) for a $100,000 computer, compared with competitors such as Alliant, Convex, Cray, IBM and Digital Equipment Corp., whose machines are rated at between one and seven MIPS for a $100,000 system, analysts remain upbeat about Multiflow's prospects.

"The single most important thing is price/performance, and it seems as if Multiflow did their homework," noted Marcia Brooks, an analyst with International Data Corp.

AIIM '87 sets stage for optical storage debuts

BY JAMES CONNOLLY
CW STAFF

NEW YORK — Networking capabilities for optical storage systems are expected to be among the key product introductions when AIIM '87, the Association for Information and Image Management's conference, opens here today.

The show also is expected to provide a forum for Wang Laboratories, Inc., Plexus Computers, Inc. and Eastman Kodak Co. to display recently announced image-management systems designed to allow computer users to have on-line access to images of paper documents.

According to AIIM officials, 15,000 attendees and 173 exhibitors are expected.

Filenet Corp., which last week introduced a $195,000 entry-level configuration of its document-image processing system, reportedly will announce several peripherals and an open systems architecture strategy for its family of document management systems.

Laserdata, Inc. is scheduled to announce I/Net, an Ethernet-compatible electronic-document management network.

Laserdata also is expected to support Optical Storage International's jukebox-style Optical Disk Storage and Retrieval Unit. Those moves are intended to provide Laserdata's Laserview personal computer-based document management system with multiuser access to data bases larger than one million documents. Laserview systems are priced from $50,000, the vendor said.

Micromedia, Inc. will be demonstrating its Optical System 100 stand-alone electronic imaging system, which uses compression techniques to store 60,000 to 80,000 letter-size images on 12-in. double-sided, write-once/read-many-times optical disks. Micromedia said the system is base priced at $94,500 and includes an AT&T 3B2 computer and a Kodak IMT-350 microimage terminal.

Other announcements expected at the conference include Bell & Howell Co.'s introduction of a personal computer-based image search system, a high-speed paper scanner, a film scanner and an electronic parts catalog system.

In addition, Formative Technologies, Inc. is scheduled to announce a system to scan and digitize computer-aided design drawings for storage on optical disks.

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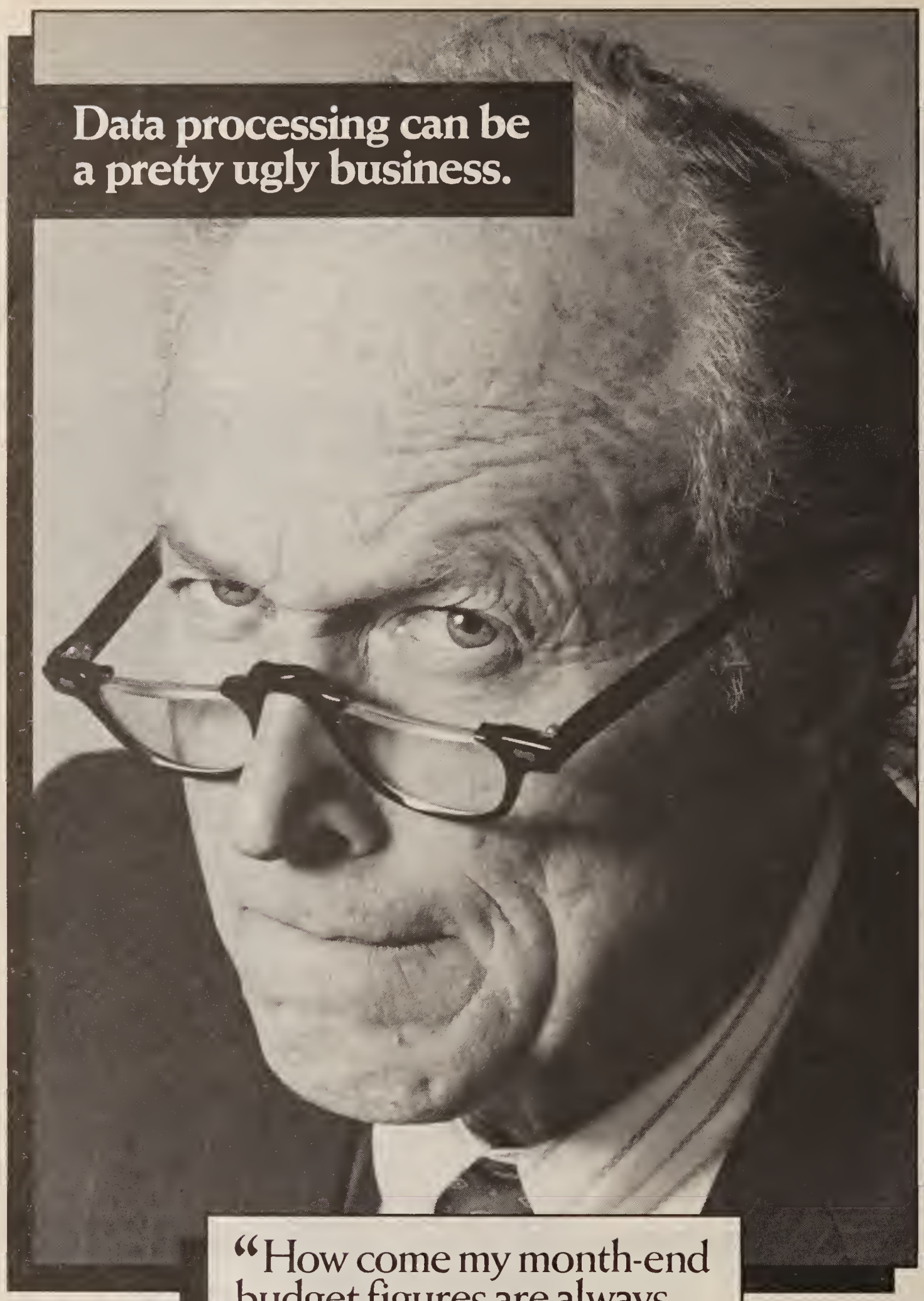

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EDITORIAL

Reveille

Lurking beneath and being pulled along by the tidal wave of personal computer announcements unleashed by IBM earlier this month is perhaps the most significant challenge MIS has faced in a generation — the management of microcomputing.

"What?" you say. "Haven't we been doing that for years?"

Well, in all too many organizations, MIS had until recently managed to leave microcomputer systems planning to others, namely those with the intestinal fortitude to deal with the burgeoning legions of end users. That arrangement worked fine as long as those novice users were content working on individual projects with individual files at individual workstations.

Then the level of end users' sophistication grew, as did their desire to interact more with one another, with shared peripherals and, finally, with (gulp) mini and mainframe files.

Slowly but inexorably, MIS began exerting its influence over the micro systems being built around them. In some companies, this influence became a formidable barrier to the proliferation of information systems; in others, more thoughtful MIS managers helped pave a smoother path.

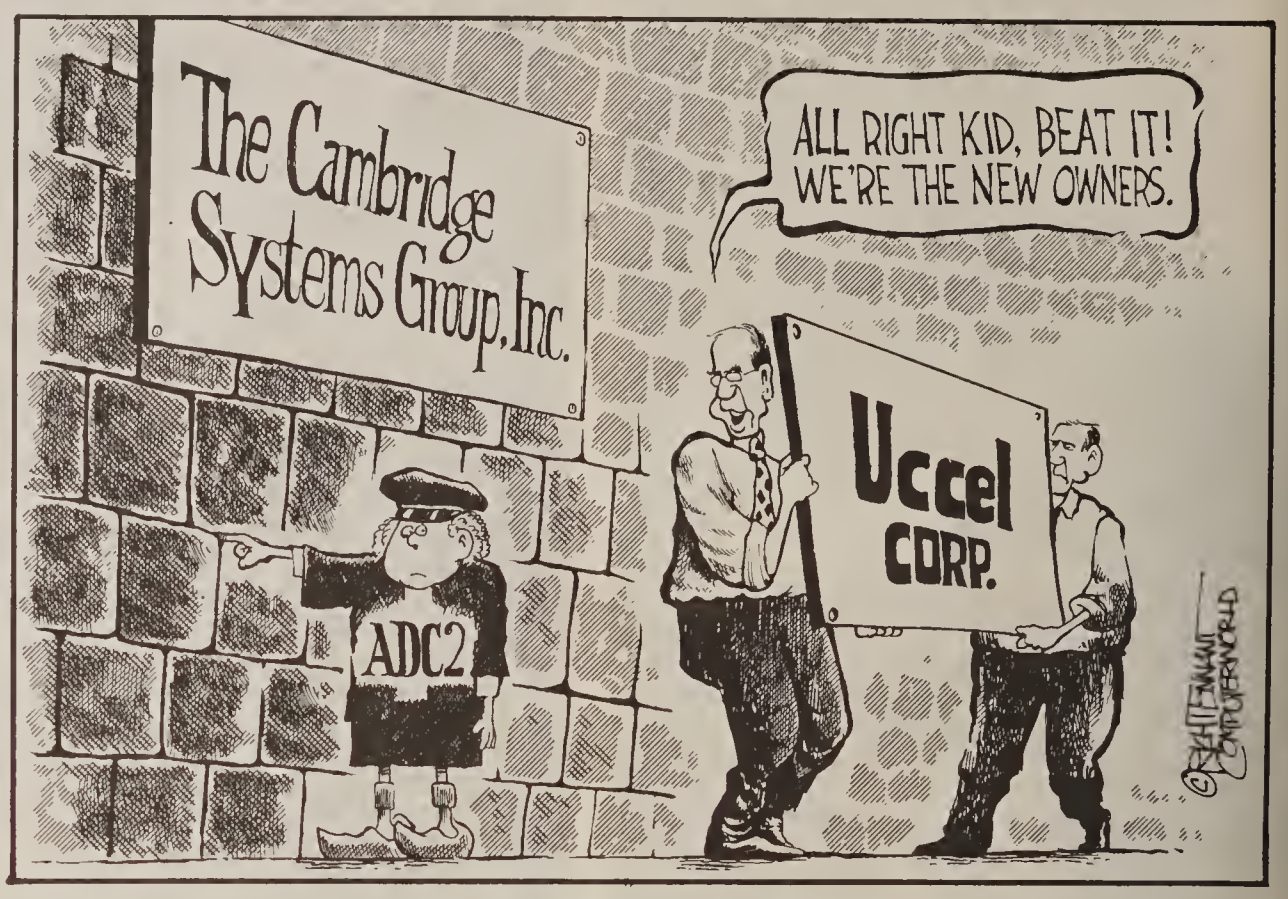
Even the personal computer weekly papers have lamented in feature articles and editorials the diminishing role of the so-called micro manager, who increasingly is subordinate to the MIS infrastructure within information organizations.

The announcement of the '386' generation of micros and new operating system standards will hasten the need for MIS to assert its preeminence in specifying computer systems. These systems will increasingly be built around microprocessor-based hardware and become part of increasingly integrated information networks.

We are already seeing proof of the growing control MIS has over the planning and acquisition of micro-based systems, and with good reason. Of the $42 billion spent on hardware purchases by U.S. businesses last year, more than half went to pay for micros and other small systems outlays. That is why a recent *Computerworld* study of 2,000 computer sites showed MIS to be the primary department in controlling and specifying personal computers in 75% of the sites, with the remaining 25% scattered among several other departments.

The challenge is not in gaining control but in making the micro-based systems work, systems that will eventually replace the traditional minis and mainframes as the primary systems building blocks. Micro-based network solutions developed during the next few years will make it possible to build total information systems serving more users far more efficiently than today. Successful MIS professionals will light the way toward this next generation of information systems. Others may try to impede the inevitable, and eventually be swept aside.

To quote an aphorism used by *Computerworld* columnist William Zachmann, "The lightning said to the oak tree, 'Stand aside, or take what is coming to you.' "



Item: *Irate users scuttle Uccel plan to drop ADC2.*

LETTERS TO THE EDITOR

Yet another twist

In Ray Saperstein's appeal to the company employee [CW, March 9], another fascinating twist was introduced into an already complex tax issue. The argument Saperstein presented in his letter, "Paycheck envy," was based on the premise that the employee was shooting himself in the foot by endorsing Section 1706 of the Tax Reform Act of 1986.

Section 1706 pertains to the tax withholding status of the independent contractor and threatens the "enviable" take-home pay of those independent contractors in technical fields who enjoy what the IRS feels is a little too advantageous of a status. From the brokerage houses of independent contractors who can underbid the labor rates of the fully compensated employee to the underpaid professor who moonlights as a technical consultant, this IRS issue has ignited sparks in the hearts (and wallets) of all involved.

Saperstein is president of his company and an independent consultant. If Section 1706 has its victims, I doubt it will be Saperstein. Otherwise, his editorial would have centered on issues of fairness and legality. Instead, he writes a condescending article urging the technical employee work force not to rock the boat by supporting Section 1706.

If Saperstein's article was meant to cloud over an IRS issue with emotion, then I'm sure it was an effective tactic. If, on the other hand, his letter was a sincere effort to make his opponents "see the light," then he should rethink his assessment of competence levels in the industry.

John Power
Delex Systems, Inc.
Vienna, Va.

CDLA facts

An article about IBM's sales of leased hardware [CW, April 6] contains significant inaccuracies.

At a meeting of the Computer Dealers and Lessors Association (CDLA) IBM Relations Committee, Chairman Richard A. Forsythe reported that IBM Credit Corp. had 19,000 serial-numbered machines reach end-of-lease term in 1986. He further reported that these 19,000 machines were remarketed primarily to the current user and that the balance were used for IBM internal requirements or resold to computer dealers and leasing companies. The article indicates that IBM salesmen resold all 19,000 units. This is untrue. IBM salesmen did remarket a few machines to end users as "interim" units to on-order new IBM machines. The number was not great.

The article also reported that IBM Credit is a dues-paying member of CDLA. This is not true.

James F. Benton
President
CDLA
Washington, D.C.

VM, X.25 role

I'd like to take exception to Rudolf Strobl's comment in your article, "Screws tighten on 4381" [CW, Feb. 9], which indicated that VM would not be used on high-end 9370s because of a lack of X.25 support.

VM presently has three system connectivity tools: Pass-Through Facility, Remote-Spooling Communication Subsystem (RSCS) and Transparent Access Facility. Each of these products supports channel-to-channel adapters for local CPU-to-CPU connections, or binary-synchronous lines for remote CPU-to-CPU data communications.

The majority of companies contemplating 9370s already have their own private network. Therefore, the statement that VM ". . . is [not] well suited to the high-end 9370" because it does not support a public-network access method, X.25, simply does not make sense. Of course, there will be some use of X.25 in a VM environment, but in the grand scheme of things, it is likely to play only a minor role.

Ronald P. Kral
Senior Vice-President,
Strategic Marketing
VM Software, Inc.
Reston, Va.

This week in history

April 25, 1977
Magnetic bubble memories have found their first commercial application in the computer industry, but not in expensive mainframes. Texas Instruments, Inc. has integrated the mass memory storage medium into two automatic send/receive versions of its Silent 700 series terminals following a three-year laboratory effort.

April 26, 1982
Six 23-year-old computers may prove to be a real gold mine for the U.S. Air Force. Attempts to salvage the first of six aging processors could yield between $225,000 and $1.5 million in precious metals, principally silver, gold and platinum, used in the solder and as connectors.

Taking a global view of office automation

JOHN KIRKLEY

In a refreshing burst of candor, Anthony Wasserman, editor of the Association for Computing Machinery's (ACM) *Computer Surveys,* admitted that despite the goal of publishing articles "comprehensible to the entire readership, that goal is not always attainable."

So true. The latest Robert Ludlum novel *Computer Surveys* is not. But in the June 1986 issue, which arrived about nine months late, there is an article that, although fly-specked with bibliographic references, is not only readable, but presents an interesting approach to what the author calls "office automation." (We will use this term since the ACM does.)

The paper is called "The Effect of A Priori Views on the Social Implications of Computing: The Case of Office Automation." The author is R. A. Hirschheim of the Oxford Institute of Information Management in the UK.

If you can get past the title without terminal ennui, you'll find an interesting cosmology unfolding: the world according to Hirschheim.

What he did was survey the literature on the impact of office automation, noting, "Unfortunately, that which has appeared is diverse and contradictory."

Hirschheim observes that there are those who see office automation ushering in a new age of productivity, job satisfaction and office modernization. There are also those who darkly claim that office automation brings with it a deskilling of the worker, drudgery, a degradation of professional achievement and the end of personal privacy.

Reality is not the issue here, the author claims. What is really going on has more to do with the a priori beliefs and values held by the observer rather than empirical facts.

Hirschheim classifies humans into three camps: optimists, pessimists and relativists. He then examines how these life postures affect the point of view taken by contributors to the office automation literature.

He comes to this point: The optimist sees technology as a tool and man as the craftsman. The skilled craftsman will use the tools to his and mankind's benefit, and the relationship between craftsman and tool is

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Kirkley, a former editor of *Datamation* magazine, is an industry consultant currently acting as editorial adviser to Patricia Seybold's Office Systems Group.

The PR dance: Shuffling off to be buffaloed

GLENN RIFKIN

The deadline hour hollers down at me from the newsroom clock.

I detect the slightest sensation of sweat at the tips of my fingers as they rest on the keyboard. The blank VDT screen stares at me intensely. I swear it whispers, "Feed me!"

The stack of scribbled notes lies motionless — and incomplete — on my desk. I had talked to users about the *hot issue.* I had gathered a gaggle of consultants to create *perspective.* And what is left? The vendor.

Going to the vendor means a side trip to the public relations office — that port for stories lost and squandered.

Reporters and PR make odd bedfellows, consistently wanting and needing each other only at diametrically opposed times. PR people, for example, have an uncanny way of calling with a story to pitch as the deadline hour looms overhead like the Goodyear blimp. Conversely, when the reporter calls with an inquiry, PR utters its famed rejoinder, "I'll see what I can do." In France, that means "au revoir."

So I pick up the phone and call a PR contact at HITECO (High-Tech Co.).

"OK," HITECO press relations specialist Sam Nogettinthrume says, "let me get this straight. You want to speak with someone about the company's *direction* on this issue?"

"That's right," I reply.

"Now, you realize that we at HITECO cannot comment on our future products?"

"Well, yes, but I don't need a specific product here as much as a sense of corporate strategy," I insist, feeling savvy and strong.

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Rifkin is a Senior Editor at *Computerworld.*

Gyring and gimbling in the wabe

'Sensitive but unclassified' information comes in from the cold

JOHN CLEMENT

When I read in the papers that the Department of Defense was calling for the creation of a new category of "sensitive but unclassified" information, it seemed like a good idea. There's too much information going around nowadays, anyhow, and not enough controls on it.

But still, I thought I should get all the facts and hold what Speaker of the House Jim Wright calls a "balanced opinion," so I invited Larchmont to lunch. Larchmont works over at Commerce in one of those trendy electronics fields.

No sooner did Larchmont sit down for his croissant and tofu than I could see he was concerned. In fact, he looked awful — bags under his eyes, the archetype of the desperate bureaucrat.

"No, I'm not testifying on the Hill," he told me. "But I don't mind telling you, I'm worried. The Russians aren't sending spies over anymore. We're just giving out the information for free, and they can pick it up with a Radio Shack 100 and a quarter for the pay phone."

"I thought that was why we had security classifications," I said.

Larchmont looked more pained than ever. "You just don't understand. Computers are getting so sophisticated now, you can't imagine the inferences that can be made from tiny amounts of the most harmless data. Take some figures on average rainfall, mix them with traffic patterns on Midwestern second-tier highways and put them in your Cray. Bango! You can predict optimal targets for infantry invasions of Kansas — and that's top secret. I shouldn't even be talking about this here. . . ."

"Calm down, Larchmont," I said. "No one's looking at us, and besides, I can't believe you can do so much with so little. Are you sure — with rainfall data?"

"Are you kidding? We're talking Class VI machines and the best inference engines. And what's coming up in the future is even scarier. There's folks at the Naval Laboratory that will be able to plot the course of history for the next 50 years by just looking at the wear patterns on a peasant's sandals."

By now, I was getting a little worried myself. I had no idea the problem was this serious. "So, Larchmont," I said, "what should we do — develop a new level of security clearances?"

"We tried that. We sent up a trial balloon, called it 'Sensitive but Unclassified Information.' But the bleeding hearts from all over joined with the Information Industry Association, of all people — we thought they were our friends — and made a terrible stink. We decided we need a more robust solution."

Larchmont gradually lowered his voice. "You didn't get this from me, right? But some of us think the government's going to have to invent a whole new kind of information: safe information. Have you heard of Form Eta?"

I nodded vaguely, not wanting to admit ignorance of a new buzzword going around.

"A few of us," Larchmont said, "have been working on a new way to express government data. You see, the problem is mostly with the numbers. If you can get rid of the numbers, what you have left is safe information. Then spying can go back to being what it used to be."

His eyes gleamed feverishly. "We don't need numbers, you see, if we can come up with the right images. And our research boys have found plenty of them. Suppose you want to talk about rainfall in Kansas, but you want the information to be safe information. Well, we have a whole new rainfall scale, based on — what do you call them? — metaphors. At one level it's "a gentle flow"; at another, "a raging torrent" or anything in between. So if you want to tell farmers what to expect, you simply issue a press release stating something like, "For the coming season, the gentle flow of rain will be unhindered."

"And the beauty is, our fastest machines can't decode the stuff, not even with the best natural language programs. And when you think about putting different kinds of data together, the results are nothing short of genius. What do you make of 'In the raging torrent on the plains, hulking shapes meander the byways?' That's the data on road use patterns combined with the rainfall information. I tell you, those Red computers will blow their motherboards! And here's another, on our five-year defense budget projects: 'Twas brillig, and the slithy toves did gyre and gimble in the wabe.' "

By then, Larchmont's voice was at a near-shout. The shadowy figure in the trench coat two tables away shook his head, ripped some sheets out of his notebook, threw his pencil down and stormed out of the cafe.

"Why, that sounds like quite a step, uh, forward," I muttered. "But do we need a new security clearance system with all this progress going on?"

"You bet we will. Sensitive Paraphrased, Secret Metaphoric and for the really big stuff — Top Allegorical. Right now, the CIA's entire humanities staff is working around the clock on this one.

"We've even got some of George Will's top people under contract."

TOMI LEVITCH

Clement is a Washington, D.C.-based observer of the computer industry.

World view

CONTINUED FROM PAGE 23

that of master and slave.

Ah, but the pessimist does not buy that. For him, technology is the governor and man is viewed as the machine in the service of technology; technology is the master, man the slave.

The relativist sees technology as inert matter and man as the gatekeeper who decides upon the type, quality and quantity of technology introduced into the system. As Hirschheim says, this latter relationship is more symbiotic. Here he tips his hand: The author is on the side of the relativists (and the relativists are on the side of the angels).

You might object that this whole matter is just an academic going through his paces, that there is no relevance to the world in which you work — a pragmatic environment in which you must make daily decisions on systems, manpower, applications and the like. But stop a minute and ask yourself: Given the definitions presented here, are you a pessimist, an optimist or a relativist when it comes to making data processing or office information decisions? How does your world view, your weltanschauung, affect you and those with whom you deal?

If you're an optimist, you probably see office automation as a boon leading to productivity increases — an argument, Hirschheim comments, that is well supported by experience. Technology, you feel, displaces some people but gives rise to new jobs directly related to the new technology. Office automation relieves the drudgery inherent in old-style office work and facilitates such benefits as flexible working hours and working at home.

The pessimist as drawn by Hirschheim has a Marxist cast. Information technology "is seen as the latest in a stream of tools and techniques used to maintain control over the working class." Unemployment is inevitable, jobs become demeaning, work at home is isolating and communication flows upward to management only. Privacy goes out the window.

The relativist argues for participation from all concerned to decide how to use an inherently neutral technology. "For office automation to be considered acceptable, it must meet specific social and ethical conditions," the relativist says.

In the last analysis, Hirschheim says, optimists and pessimists share a deterministic world view. Underlying their beliefs is "the clear, uncompromising view of the growth of technology. It is unstoppable and fundamentally uncontrollable." The relativist, however, feels we can control technology and advocates participation of the "affected parties."

The world according to Hirschheim deserves to be investigated. It could be that the exposure will bring you a new level of awareness of your own predilections and peccadillos as you go about your day-to-day business, making decisions, determining people's work lives and being at large in the world.

Shuffling off

CONTINUED FROM PAGE 23

"Hmmm," Sam says. "What is your deadline?"

This, I knew, was Sam's first move on the chessboard.

"I've got a 3:00 deadline to get this in Monday's paper," I reply firmly.

"Oh, come on," Sam sighs. "It's 11:00 now. How do you expect me to set this up that fast?"

"The story just broke this morning," I argue. "There's got to be someone who can comment in the next four hours."

"Well, I can't promise anything, but let me see what I can do," Sam says emptily.

The last time Sam told me he'd see what he could do, I didn't hear from him for two weeks. When I tracked him down on that occasion, he clearly had answered his phone by mistake.

He pleaded ignorance. "What was it you wanted again?" he asked. "Oh yeah, right. Well, you know Caddell was transferred last week, and I tried to put you in touch with Johnson, but he was in Europe, and his assistant didn't feel comfortable with the interview. And, of course, we've reorganized that department, so it really doesn't fit your question anyway. But let me see what I can do, and I'll get back to you by 4:30."

Four-thirty came and went that day. The next morning I called Sam's office again. "Oh, Sam's gone to a two-week training course off-site," his sweet-voiced secretary said. "Is there anyone else who can help you, sir?"

"Yes," I replied then. "Do you have a career counselor handy?"

Today, learned and wizened, I don't let Sam slip so easily into the unreachable netherworld of HITECO. "I'll call you in an hour to see what progress you've made," I suggest.

I think I hear laughter but can't be sure. "OK, fine," Sam says smugly. "And by the way, you know we usually want these kinds of questions submitted in writing beforehand."

I consider the options. I can tell my editor that a stray dog came through the newsroom and ate all my notes. I can tell him I sent the story to him and the system must have gone down and lost it. I can get on my knees and cry on his shoes.

"OK, Sam. You win. Give me a statement," I mutter.

"I thought you'd see it my way," he says. "Here goes: 'HITECO is committed to maintaining its position in the industry by providing our customers with the best tools available. . . .' "

SOFT TALK

Charles Babcock

4GLs seek relationship

When the the Defense and Electronics Center of the Westinghouse Electric Corp. in Baltimore wanted to ease the strain of reporting on a federal contract, it installed a fourth-generation language to use with its relational data base management system.

The combination would appear to be one of those marriages for which everyone has been waiting. The relational data base offers flexibility in data retrieval and reporting, while the fourth-generation language offers end users the chance to query the data base and draft reports without getting bogged down in a lot of syntax.

Barbara E. Pembamoto, manager of the defense center's information center, does not say Nomad2 (D & B Computing Services' 4GL) used with IBM's SQL/DS represents an information nirvana, though she said the information made available "paid for Nomad2 with one project."

Pembamoto addressed a recent Shaku Atre conference in Washington, D.C., on the use of fourth-generation languages and IBM's relational data base products. She claimed the system enabled end users to use Nomad2 without training. She was reluctant to describe the scope of the project or type of reporting executed through Nomad2 but said end users found it a powerful reporting tool.

"Once end users got used to Query Management Facility (QMF), we had to look for something more powerful," she said.

End users participated in this evaluation, which Pembamoto said helped ensure the success of the fourth-generation language once it was installed.

"If they don't like the product, they will find ways not to use it," she observed.

From an end-user point of view, a fourth-generation language is a better way of accessing a relational data base man-

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Unix may fill McDonald's order

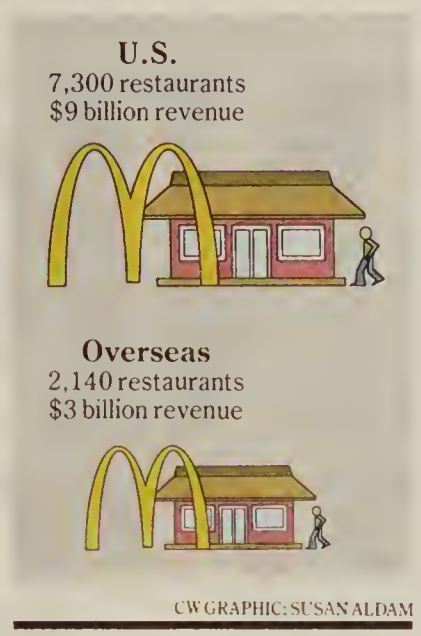
BY JEAN S. BOZMAN
CW STAFF

OAK BROOK, Ill. — McDonald's Corp. is an IBM mainframe shop, but four years ago, in an attempt to help foreign franchises report their revenues, McDonald's turned to Unix.

A prototype system, the International Business System (IBS), was used in Europe and Asia. It proved so successful that McDonald's is refining it for possible installation in U.S. operations.

McDonald's does not comment on many aspects of the computer system, but the fast-food giant is believed to be one of a few examples of an IBM mainframe company considering Unix for its geographically dispersed business operations.

McDonald's operations



CW GRAPHIC: SUSAN ALDAM

The company is believed to be looking for 32-bit, superminicomputer hardware that can run what will be AT&T's Unix System V applications. The standalone systems would allow end users to practice standard accounting functions, while enabling franchisees to report their receipts to headquarters here, industry observers say.

The move to Unix in the U.S. is being characterized by John Osvath, director of information processing, as a pilot project.

"We were one of the first companies to try to do a major corporate accounting system in Unix," says Ted Nagengast, a senior systems developer at McDonald's corporate headquarters. McDonald's needed to support a variety of international franchise operations with a single software solution that could be maintained on a variety of hardware systems, plus provide a good development environment, he explains.

The McDonald's Unix applications would address most needs of an independent franchisee, such as office automation, payroll and accounting applications.

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Inside

VAX disaster recovery plan criticized

Firm blames slowdown on unexpected customer demand, growth

BY DONNA RAIMONDI
CW STAFF

In May 1985, Digital Equipment Corp. blitzed the press with news of an ambitious disaster recovery plan for VAXs, but the part of DEC's Recovery Services plan that exists today can be difficult for MIS managers to find.

The plan promised to provide seven hot sites around the country, complete with VAXs, communications lines and administration space, all to be completed by the end of the summer of 1985. It also included an emergency maintenance program, shell sites ready for the customer's usable equipment and offsite disk and tape storage vaults with pickup service.

However, when customers today try to get information about parts of the plan from DEC representatives, especially about the hot sites, they sometimes meet with puzzled looks and little help.

"If they are trying to sell this plan, they are going about it in a very strange way," one prospective user in Texas says.

The MIS manager had already secured his IBM mainframe installation with a contingency plan and wanted to do the same for his DEC minicomputers. Calls to local and regional DEC offices got him promises of information but little else.

The program has not attained its goals. DEC now offers two hot sites, one in Parsippany, N.J., which DEC calls the New York site, and one in Schaumburg, Ill., known as the Chicago site.

"When we first entered the business a couple of years ago, the level of awareness within the customer base wasn't as high as we expected it was at the time," program spokesman John Evans says.

The disaster recovery plan is not well publicized because it is not a priority at DEC, another spokesman says. "We haven't gotten full support of our business managers for this because they see disaster recovery for minicomputers as an emerging area at this point," he comments.

The lack of contingency facilities has caused some DEC users to drag their feet on disaster recovery planning. The U.S. Postal Service Federal Credit Union, for example, suffered a four-alarm fire in its Washington,

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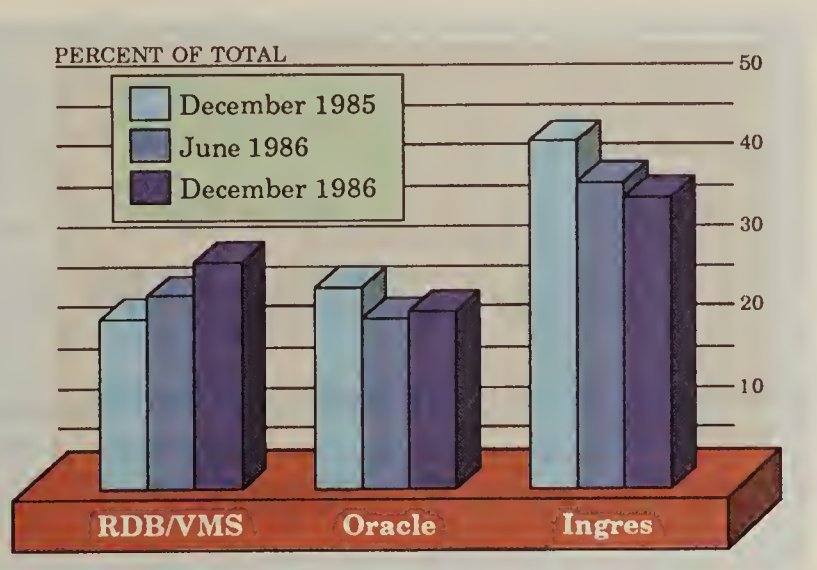
Data View

Market share of relational DBMS on DEC's VAX

The race has begun; DEC's RDB is gaining share at the expense of both Oracle and Ingres



INFORMATION PROVIDED BY COMPUTER INTELLIGENCE
CW CHART

Gartner Group sets distributed standards

BY CHARLES BABCOCK
CW STAFF

At a time when vendors are making competing claims for distributed data base capabilities, the Gartner Group, Inc. has adopted seven rules with which to evaluate distributed products.

The rules, or standards of transparency to users, were formulated by Michael Braude, vice-president of the Gartner Group's Software Research Center. The aim of the standards is to require a distributed data base management system to provide location transparency, or full DBMS functions, regardless of the location of the user or data base.

Although Oracle Corp., Relational Technology, Inc., Tandem Computers, Inc. and Sybase, Inc. all offer pieces of distributed data base technology, no vendor meets all seven standards, Braude said. A full distributed system would have to be based on a global data dictionary and "a sound underlying process of distributed query optimization." In addition, the dictionary capability must be distributed across the different nodes of the network. "That is beyond the current state of the art, which is characterized by some transparencies based on a global, but not a dis-

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Cincom updates Ultra's capabilities

BY NINAMARY BUBA MAGINNIS
CW STAFF

CINCINNATI — The new release of Cincom Systems, Inc.'s Ultra Interactive Data Base System, a relational data base management system for Digital Equipment Corp. VAX computers, incorporates some simple distributed capabilities, the vendor claimed.

Ultra Version 1.5 also includes data base file maintenance utilities, increased security within the Spectra relational query language — Cincom's proprietary language used instead of SQL — and additional referential integrity within Ultra's relational data manager.

Ultra has a small installed base in what has been a fast-growing market. Cincom reported 350 licenses issued, compared with more than 3,000 units licensed for the VAX by both Oracle Corp. and Relational Technology, Inc.

Cincom said the new release can act as a network server in a DEC distributed environment. Users at a single remote site can access and update files controlled by a DBMS in another location. The data base manager on the local machine will search for the data base locally, Ultra product manager Doug Baer said. If the local search fails, the data base manager will then seek the data base on the network, logging on to the remote node without user intervention, Baer explained.

The data base files could reside on any node but generally will be located at a central server site to maintain data base integrity. If there is a failure during a remote session, a recovery mechanism will roll back to the last commit point, precluding the need to start a remote session from the beginning, Baer noted.

The data base software also includes a set of data base file maintenance utilities. The utilities give data base administrators the ability to unload and reload data as much as 79% faster than before, the vendor said.

"Initially, the code was written in Cobol. The implementation was not built for high speed. It was built for robust, make-sure-it-doesn't-break utility," Baer said. The updated file maintenance utility, written in C, appears to the VMS operating system as a DEC Digital Command Language (DCL) program.

Previously, the utilities could be accessed only through a menu. Now, a user can write a DCL program, for example, that performs a structural maintenance operation, Baer said. The mechanism simplifies the scheduling of certain jobs to run overnight when the system is offloaded, the product manager said.

Greater security

Ultra Version 1.5 reportedly features improved security within the Spectra relational query language. Cincom plans to support both ANSI and IBM SQL standards, said Ronald R. Hank, senior manager of Cincom corporate relations. Hank did not specify when support would become available.

With Spectra's new security features, a data base administrator or system administrator can create and modify user profiles and set limitations on which files and applications a user can access, according to the vendor.

Ultra Version 1.5 includes enhancements to Ultra's Relational Data Manager, providing additional referential integrity checking for Ultra Physical Data Manager files and DEC RMS files. Data base integrity takes place within Ultra, not within individual applications, the vendor said.

Ultra Version 1.5 comes with Mantis Version 1.1, the latest release of Cincom's fourth-generation application development system, the vendor reported.

Ultra operates on all DEC VAX machines under DEC's VMS operating system. Prices start at $20,000 and increase to $99,000, depending on the computing environment. Quantity and Vaxcluster discounts are available, the vendor said.

McDonald's

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Ever since the early 1980s, McDonald's had been looking for a way to write a financial system just once — and a way to allow users to upgrade their hardware as their business grew.

"We knew our markets would grow," Nagengast says, "and we needed to give our overseas operations turnkey solutions that would grow along with the business."

McDonald's regional operations in Europe and Asia turned to a number of IBM mid-range System/34s and 38s to get the financial jobs done. But applications written for those systems could not be used with other hardware.

"Our business is selling hamburgers," Nagengast says. "Everything we do is geared toward helping our store managers sell hamburgers. So we didn't want to create any burden for MIS people in our local offices abroad."

First installed in March 1984, the IBS is now used in roughly half of the 2,140 McDonald's stores overseas. These stores generate nearly $3 billion in sales annually. The 7,300 U.S. stores contribute about $9 billion to McDonald's annual sales.

Osvath says the aim of the IBS automation program was to provide some measure of office automation, personnel tracking and sales records to small DP organizations overseas.

"The way we run our offices is fairly standard," Osvath says, "and in a small office, the emphasis is on communications." For this reason, McDonald's uses the CCITT X.25 protocol along with dial-up lines to link the remote Unix systems, as well as the remote System/34s and 38s, to the corporate mainframes.

When IBS was in the design phase, McDonald's programmers were faced with a set of critical decisions. They had already chosen to build a system on top of System 3, Version 7 of AT&T's Unix. But they also saw the need to add features that would provide user-friendliness and security. Without them, end users might not have been comfortable converting their manual records into electronic ones.

A key concern for McDonald's was that end users not be able to modify the key business application. "We try to insulate the end user from anything outside the application itself," Osvath says.

Osvath maintains that McDonald's has stayed away from on-line real-time updates of its operations around the world. Instead, it consolidates its financial reports monthly, as sales figures are reported. The centralized data base is maintained on IBM 3090 and Amdahl 5890 mainframes in Oak Brook.

"We've laid down a foundation that gives us — and our independent franchises — the maximum flexibility," Nagengast says.

One important consideration in moving to the Unix systems, Nagengast says, is that it was difficult for McDonald's to count on providing much hand-holding for end users stationed thousands of miles away. Furthermore, MIS management felt it would be unlikely that any one vendor, including IBM, could support all of McDonald's operations.

"We had to be able to grow without constantly reinventing our software," Nagengast says. "We like to run lean, and that means not having to buy any more equipment than we need to."

Adesse ships VM utility

DANBURY, Conn. — The Adesse Corp. said last week that it will begin shipping a communications utility for the IBM VM environment this week.

Aefast/VMCF was designed to improve data transfer performance for those VM installations using IBM's VM Communications Facility (VMCF). VMCF allows users to transfer data from one virtual machine to another.

The Aefast/VMCF is said to alleviate problems that can occur with VMCF.

Among its other features, the utility reportedly decreases response time and decreases the amount of CPU time that is needed for data transfer.

Aefast/VMCF increases the size of a block of data that can be sent at one time from 2K bytes to 4K bytes, according to Ron Sella, Adesse's marketing manager.

The software can be leased for $160 per month or purchased for $3,800 with a 12% annual maintenance fee, Adesse said.

4GL

FROM PAGE 25

agement system than SQL statements or even the end-user part of QMF, Query By Example (QBE). QBE "does everything IBM says it does and nothing more," said Timothy D. Fuller, support director for Nomad2 and SQL/DS in Westinghouse's information center.

Nomad2 offers a screen-driven interface that allows IF/THEN updates and report formatting that SQL and QBE cannot provide, Fuller said.

Nomad2 and other fourth-generation languages, such as Focus from Information Builders, Inc. and the Ramis Information System from On-Line Software International, Inc., translate nonprocedural queries into SQL statements, returning the results to the user.

Serving as an interface to a relational data base helps the fourth-generation language earn its keep.

At Blue Cross/Blue Shield of New Jersey, Chief Information Officer Edward D. Williams said Ramis is used to allow actuaries to obtain information they need for calculating insurance risks. Ramis translates ad hoc queries into SQL queries run against a new IBM DB2 customer information data base. The data base allows actuaries to use information that was previously stored in six separate IMS data bases, Williams said.

Little experience

Each of these users has little experience with DB2 and even less using a fourth-generation language in conjunction with DB2. One result was that none of them were sure what would happen once end users began composing their own queries, which might or might not tap existing indexes to DB2.

DB2 analyzes each query and decides whether to go to indexes, which will steer it directly to the rows and columns sought or scan the whole data base.

"The Ramis interface doesn't pass parsed query sequences to SQL, so it doesn't use the indexes we thought it would. You request particular columns, but DB2 will do its own sort," Williams said.

Gary Muskowitz, assistant vice-president of Bankers Trust Co. in New York, is a Focus user. He said vendors should build timers into their languages so users can tell how many CPU resources were being tied up satisfying a query.

Greg Wilmore of Deere & Co., the Moline, Ill., farm equipment manufacturer, predicted that wider use of relational technology with fourth-generation languages will create an explosion in demand for host resources. "These users don't realize the underlying data base may contain 150 million to 200 million records. They don't realize what SQL statements are being generated or the processing they require."

Babcock is *Computerworld*'s senior editor, software & services.

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San Francisco	April 21	New York	April 29	Cleveland	May 6	Toronto	May 13
Los Angeles	April 22	Kansas City	April 30	Denver	May 7	Hartford	May 14
Seattle	April 23	Boston	April 30	Cincinnati	May 7	Newport Beach	May 19
Vancouver	April 23	Houston	May 5	New Jersey	May 12	Ft. Lauderdale	May 19
Chicago	April 28	Detroit	May 5	St. Louis	May 12	Atlanta	May 20
Philadelphia	April 28	Dallas	May 6	Washington D.C.	May 13	Raleigh	May 21
Minneapolis	April 29						

VAX plan

FROM PAGE 25

D.C., headquarters in October 1984. Despite the fact that it took the unprotected credit union five months to resume normal operations, it still has not subscribed to a disaster recovery plan. Part of the reason is that there is no DEC hot site in the Washington, D.C., area, according to Ann Tran, data processing manager.

"It would be very bad for us to use a hot site in New York because we need to do updates every day," Tran says. "We also need access to our systems [a VAX-11/750 and PDP-11] right away — we can't wait for it."

Tran and her management have decided to subscribe to DEC's services in the next couple of months anyway, because they feel they are playing with fire by not making any contingency provisions, she says.

Value underestimated

Part of the reason disaster recovery schemes like DEC's have not grown faster is that minicomputer managers do not understand the value of their minis in the overall computing scheme, says Norman Harris, president of HSH, Inc., a contingency planning firm in Dublin, Ohio.

"They think that DEC can just set them up with another machine, but it's not that easy," Harris says. "They forget about telecommunication requirements; they forget about interfacing to the mainframe; they forget about delivery dates and places to put the equipment," Harris contends.

DEC has no plans at present to add another hot site, a move it says will happen when there is enough customer demand.

Meanwhile, Evans maintains that contingency planning awareness is increasing as a result of pressure from companies' auditors.

Standards

FROM PAGE 25

tributed, dictionary," Braude said.

The rules of transparency are as follows:

1. Retrieval transparency. A user can retrieve data from any site, regardless of where the transaction originates, and receive results that are the same as any other site.

2. Update transparency. A user can update data at any site, regardless of where the update originates, with the same effect as an update from any other site.

3. Schema transparency. Any user can issue data definition language schema changes from any site and have those changes visible throughout the network.

4. Performance transparency. A command issued at one site performs in the same manner as the same command from any other site. For performance to be comparable, a distributed system must have a distributed query optimizer that can view the entire network and construct an access plan for a distributed command, Braude said.

5. Transaction transparency. A transaction can update multiple sites in a two-phase commit sequence. Before an update takes effect, all target sites are prepared, with a follow-up command executing the update. The two-phase commit is "a basic building block of distributed data base," Braude said, and is needed to maintain data integrity by assuring that updates occur within "a narrow window of vulnerability."

6. Copy transparency. This transparency is related to a military requirement that the loss of one site on a distributed network should not cost the system any data. By being able to support redundant copies of data base objects, the system maintains high availability of data despite the loss of some nodes. None of the existing products support copy transparency, Braude said. He expects it to appear next year.

7. Tool transparency. The last standard is a more ambitious rule than its six predecessors. It requires that all tools provided by the vendor for its distributed environments should be applicable to all sites.

NEW PRODUCTS

Systems software

Structural Dynamics Research Corp. has enhanced its **I-Deas Geodraw** two-dimensional drafting module for its I-Deas software system.

New features include an icon-based user interface, expansion of dimensioning types including ordinate dual- and angled-linear dimensions; associative dimensioning, which provides for automatic dimension updating; macro programming language; line weights; intelligent fonts; and multiple sheet drawings.

I-Deas Geodraw is available on Digital Equipment Corp. VAX and Microvax systems as well as Apollo Computer, Inc. and Sun Microsystems, Inc. workstations.

The drafting module is priced from $6,500.

Structural Dynamics Research, 2000 Eastman Drive, Milford, Ohio 45150.

VM/CMS Unlimited, Inc. has announced **Fast Checkpoint**, which is said to speed the recovery of VM spool files in the event of a system crash.

Fast Checkpoint is said to read an entire cylinder of spool files from disk in one operation. It also reports each spool file inconsistency that is detected.

Fast Checkpoint supports both checkpoint and force starts. A password protection scheme is used to ensure that when files are discarded during a force start, it is intentional.

Fast Checkpoint is available for VM/SP Release 3 and 4. It costs $4,000 per CPU plus 12% per year for maintenance. It may be leased for $180 per month.

VM/CMS Unlimited, 161 Granite Ave., Boston, Mass. 02124.

Goal Systems International, Inc. has announced **Access/VM**, a multiuser CMS file system.

Access/VM is said to allow multiple, simultaneous read/write access to CMS minidisks. It provides extended minidisk security that externally controls read-only and read/write access to the CMS minidisks from the VM directory. The system also allows for in-storage file directory validation, eliminating the need to constantly reaccess actively used minidisks.

Access/VM is priced at $6,720 for a permanent license or $168 per month under a three-year renewable license.

Goal Systems International, 5455 N. High St., Columbus, Ohio 43214.

Applications packages

Tektronix, Inc. recently announced **Version 9** of its **Plot 10 Teknicad** computer-aided drafting package for various hosts, terminals and graphics workstations.

Version 9 is said to feature expanded macro programmability, a project views function to simplify generation of isometric views, user interface enhancements and a feature called symbol attributes. Version 9 also supports electrostatic printers and plotters.

Teknicad Version 9 is priced from $25,000. Annual update agreements start at $500.

Tektronix, P.O. Box 15273, Portland, Ore. 97215.

Tektronix, Inc. has released **Version 2** of its **Plot 10 Teknicap** presentation graphics package for use on Digital Equipment Corp. and Tektronix mainframes, terminals and workstations.

Version 2 of Teknicap is said to accept outside graphics files from other sources, such as design, analysis and drafting software, for use in presentation visuals. The outside files can be combined with Teknicap-produced graphics, diagrams and text slides, and the completed images can be produced on media such as paper, overhead transparencies and film.

Another new feature is the ability to output images to digital film recorders.

Teknicap Version 2 is priced from $2,500.

Tektronix, P.O. Box 15273, Portland, Ore. 97215.

Autodesk, Inc. has ported its **Autocad** computer-aided design and drafting software package to the Digital Equipment Corp. Vaxstation 2000 and Vaxstation GPX workstations.

Drawings generated by Autocad Version 2.5 or later, under IBM's PC-DOS or Microsoft Corp.'s MS-DOS, are compatible with those generated by Autocad under VMS. According to the vendor, in an environment incorporating personal computers and multitasking VAX workstations, drawings can be interchanged between the two operating systems.

Autocad Version 2.6 under VMS is priced at $2,850.

Autodesk, 2320 Marinship Way, Sausalito, Calif. 94965.

Languages

National Information Systems, Inc. has enhanced its **Accent R** fourth-generation language for the Digital Equipment Corp. VAX computer.

Enhancements include pop-up screens, pop-up menus, fill-in data entry forms and a package for the development of screen-oriented applications. Accent R costs from $4,000 to $99,500.

National Information Systems, 20370 Town Center Lane, Cupertino, Calif. 95014.

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Utilities

Online/Database Software, Inc. has announced **IDMS-DC Cobol Support for The Application Builder** (TAB).

The support is said to expand the compatibility of TAB with Cullinet Software, Inc.'s IDMS/R, ADS/Online, ADS/A and IDMS Batch Cobol functionality. It is said to allow users to build on-line Cobol applications using a screen painter on the IBM Personal Computer XT or AT and run them on the PC or upload them to the mainframe.

TAB is priced from $5,000. IDMS-DC Cobol Support costs an additional $1,500.

Online/Database Software, One Blue Hill Plaza, Pearl River, N.Y. 10965.

Axios Products, Inc. has announced **Release 2.3** of its **SPI-Tab** package for DOS, MVS and XA with CICS and IMS environments.

SPI-Tab is said to provide on-line access to application tables for updating and maintenance.

Enhancements to Release 2.3 of SPI-Tab include the On-line Assistance option that enables end users to obtain answers to both general product use questions as well as specific questions about SPI-Tab tables.

A screen painting option is said to allow users to design and edit screen layouts.

SPI-Tab is priced from $10,500 to $22,000.

Axios Products, 1455 Veterans Highway, Hauppauge, N.Y. 11788.

Development tools

Inference Corp. has ported its **Automated Reasoning Tool** (ART) to Digital Equipment Corp. VAX/VMS systems.

ART/VMS was designed to develop business-critical expert systems applications. The software is written in the C programming language. Capabilities include memory management, a pattern-matching structure that joins patterns from the left and right, integrated object-oriented and rule-based programming, graphics and programmer interfaces.

ART/VMS will be priced at $29,500 through July of this year.

Inference, 5300 W. Century Blvd., Los Angeles, Calif. 90045.

Clyde Digital Systems has released **Procode V2.0**, an enhanced version of its code generator for Digital Equipment Corp. VAX/VMS systems.

Procode is said to create source code in languages such as VAX Basic, Cobol, Fortran, C and assembly. It is menu driven and screen oriented, so complex language syntax is not needed, the vendor said. Based on the user's entry of data base design information, report or data-entry screen images and the logical procedures to be used, the system creates 100% of the described application. Human coding is not required. Generated programs are compiled and run independently of the Procode tool.

The Procode system is priced from $55,000 to $85,000.

Clyde Digital Systems, P.O. Box 4500, Provo, Utah 84603.

Westmoreland Software International, Inc. has released **Version 7.1** of its **Add System** for the IBM System/34 and 36.

The Add System is said to generate RPG source code and documentation for reports, on-line inquiries, file maintenance programs, batch programs and bar graphs.

Features of Version 7.1 include a report-writer language developed for non-programmers, the ability to preserve modification to RPG source code, full access to screen attributes for fields and the ability to enter compile-time arrays.

In addition, Version 7.1 of the Add System has the ability to copy programs from one CPU to another, the ability to handle alternative index files with incontiguous keys and three enhanced manuals.

Version 7.1 of the Add System is priced at $3,850.

Westmoreland Software International, Suite 195, 853 E. Semoran Blvd., Casselberry, Fla. 32707.

Promod, Inc. has unbundled its integrated computer-aided software engineering (CASE) environments, including **Promod/SA**, **Promod/RT**, **Promod/MD**, **Promod Code Frame Generators** and **Promod/SC**.

Promod/SA is a Yourdon-DeMarco-based structured analysis module. Promod/RT is a structured analysis module with real-time extensions.

Promod/MD is a modular design and pseudocode langauge module.

Promod/SC is a structure chart utility.

The modules are said to support the complete CASE life cycle on Digital Equipment Corp. VAX systems, IBM Personal Computers, Hewlett-Packard Co. Vectra computers and AT&T 6300 series models.

Pricing for the Promod systems starts at $8,000.

Promod, 23685 Birtcher Drive, El Toro, Calif. 92630.

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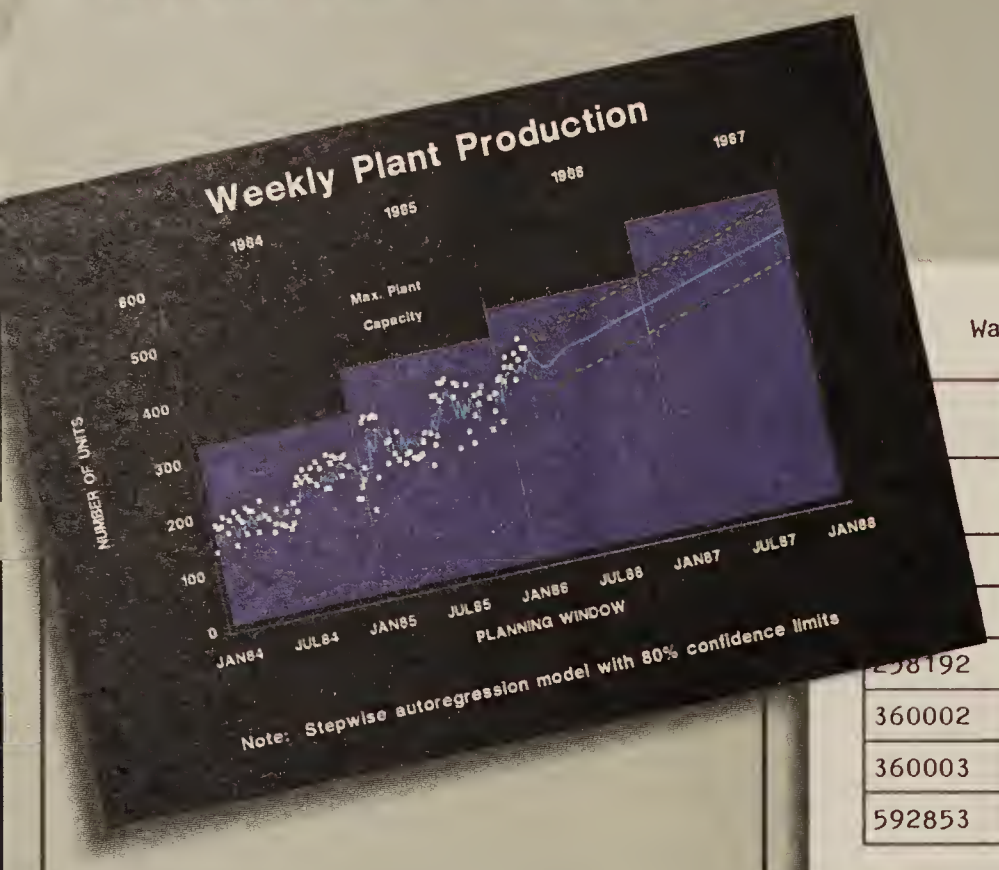

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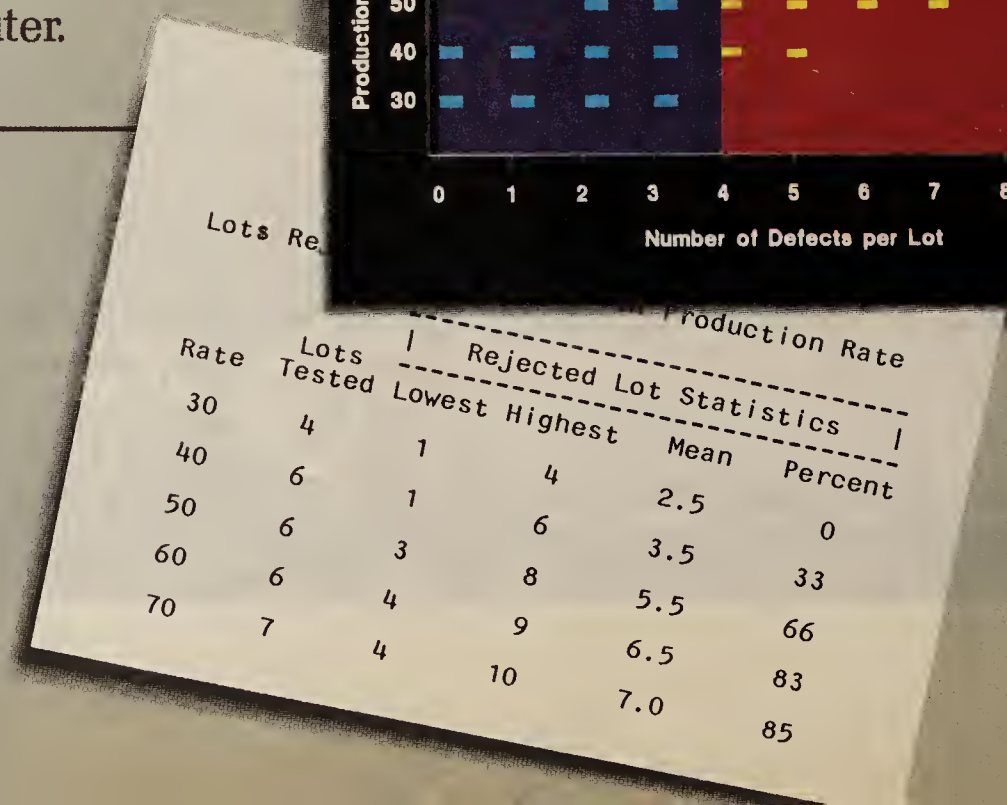

* Computer Intelligence, January 1986.

The SAS System runs on these minicomputers: Digital Equipment Corp. VAX™ 8xxx and 11/7xx series under VMS;™ and MicroVAX II™ under MicroVMS™; Prime Computer, Inc. Prime 50 series under PRIMOS®; and Data General Corp. ECLIPSE® MV series under AOS/VS. The SAS System also runs on IBM 370/30xx/43xx and compatible machines under OS, CMS, DOS/VSE, SSX, and ICCF; IBM XT/370 and AT/370 under VM/PC; and IBM PC XT and PC AT under PC DOS. Not all products are available for all operating systems.

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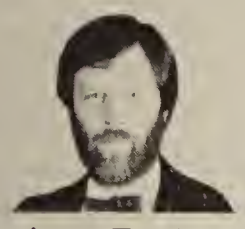

William Zachmann

Moving 4Word

Back when Lotus Development Corp. introduced Symphony — which integrates spreadsheet, word processing, data base, graphics and communications — many thought the 1-2-3 program was on its way out. Of course, nothing could have been further from the truth. Lotus's 1-2-3 continues to be the spreadsheet program of choice for a majority of users.

With roughly three-quarters of a million copies of 1-2-3 shipped in 1986, its sales greatly exceed those of Symphony. It would be easy to conclude that the vast majority of users just aren't all that interested in integrated products like Symphony.

Nevertheless, there is considerable evidence that users really are interested in the broad range of functions the integrated packages provide. They just don't want to give up the program they are already accustomed to using.

Nowhere is this more evident than among users of 1-2-3. For thousands of users, 1-2-3 is their primary way of using IBM and compatible personal computers. Predominately working

Continued on page 37

Visicalc, 1-2-3 head to head

BY MARY CHAVES
SPECIAL TO CW

The recent lawsuit by SAPC, Inc. — the firm that launched Visicalc, the first microcomputer spreadsheet — claiming Lotus Development Corp.'s 1-2-3 copied the "look and feel" of Visicalc prompted *Computerworld* to do a side-by-side comparison of the two products.

Although SAPC claims that Lotus copied the version of Visicalc that runs on Apple Computer, Inc.'s Apple II, the *Computerworld* comparison was done between IBM versions of each product. Upon careful examination, major similarities and differences were found.

At first glance, the spreadsheets in Visicalc and 1-2-3 are similar. There is a three-line status area at the top of the screen in both applications. This area includes an entry line, a prompt line and an edit line. In addition, Lotus's 1-2-3 uses an echo effect similar to Visicalc's in the first line, where the current address of the cursor in the spreadsheet is displayed on the screen. The only cosmetic difference is that Visicalc highlights the first two lines of its status area while 1-2-3 does not.

Below the status area is the industry-standard window, which shows a portion of the electronic work sheet. In both programs, columns are designated by letters; the rows, by numbers. In addition to these comparable characteristics, 1-2-3 uses the same default setting for the size of the work sheet cell — nine characters.

Concerning terminology, what 1-2-3 calls a "cell," Visicalc calls an "entry position." What 1-2-3 refers to as an "address," Visicalc calls a "coordinate." There are, however, no visible differences on-screen.

Although the Lotus work sheet appears to be similar to that of the Visicalc work sheet, there are some differences in the status area. In both programs, the first line shows the current cell address (where the cursor is positioned), such as the "A1:" address. This line also echoes the contents of that cell.

Included in this echo, in both programs, is a character designating the contents of the cell to be either a label or a value. (Even the novice spreadsheet user recognizes the importance of making this differentiation; calculations can be performed only on values and cannot include cells

Continued on page 38

Rodime hard-disk card fits Model 30

Updated R-Card 45 boasts 28 msec seek time, is XT- and AT-compatible

CLEVELAND — Rodime, Inc.'s Peripheral Systems Division has unwrapped a hard-disk card for IBM's recently announced Personal System/2 Model 30 that it claimed has an average seek time of 28 msec.

The product is an enhanced version of the company's R-Card 45. Besides being compatible with the PS/2 Model 30, the enhanced product is said to work with IBM's Personal Computer XT and AT.

Rodime said it will supply both 5¼- and 3½-in. diskettes with each drive.

The product comes with two sets of cables that allow direct connection to the PC XT, AT and Model 30's power supply. These connections avoid motherboard distribution problems. The card can be installed into any of the three available slots in the Model 30.

Getting around limitations

The product also is available with a full device driver and installer that allows users to get around IBM's PC-DOS 32M-byte limit. The R-Card 45 also supports Microsoft Corp.'s MS-DOS 3.3 and can acess its disk-partition utilities.

"The R-Card 45 is the only way for Model 30 users to get more than 20M bytes of internal storage," said Tim Mahoney, vice-president and general manager of Rodime's Peripheral Systems Division.

"We have a solution that truly takes advantage of the speed of the 8-MHz microprocessor," he said.

Mahoney pointed out that by using the hard-disk card for storage, users get the advantage of 45M bytes of storage plus the use of an additional floppy.

The suggested retail price for the R-Card 45 is $1,495.

Tool turns PC AT into AI station

BY DAVID BRIGHT
CW STAFF

CAMBRIDGE, Mass. — Hoping to speed the acceptance of artificial intelligence within corporations, Gold Hill Computers, Inc. last week announced Goldworks, an expert-system building tool that it claims brings the capabilities of dedicated AI workstations to the IBM Personal Computer AT.

Gold Hill also announced last week upgrades to its Golden Common LISP language and Golden Common LISP development environment.

Because applications created using the Goldworks expert-system building tool can be used on existing IBM PC ATs, it represents a distinct advantage when compared with higher priced, dedicated systems that cost as much as $100,000, Gold Hill officials claimed.

"Corporations need to develop expert systems that they can deliver to large numbers of users," said Jerry Barber, vice-

Continued on page 36

Inside

Apple sees dealers spearheading its MIS attack

This is the conclusion of a two-part interview with Charles Berger, Apple Computer, Inc.'s vice-president of business development. Berger spoke recently with Computerworld *Senior Editor Patricia Keefe.*

Can you explain your National, or Key, Accounts program?

That sales force and selling effort is only directed at 75 accounts. Parallel to that — and expanding Apple's relationship with organizations like Businessland, Nynex Corp. and others — is the dealer world, which has targeted its efforts at the Fortune 1,000 marketplace, as well as, in some cases, small and medium-size businesses.

They are refocusing their efforts from purely calling purchasing agents and offering the best price on an MS-DOS machine to calling and working on demand-creation for products that they can make a significant profit margin on, and the Macintosh has been one of those. Our efforts beyond the 75 key accounts have been carried on by our dealer network and, in some cases, by our [value-added reseller] network.

How are you going to convince MIS to buy in volume from dealers?

Well, we see a couple of trends happening, and we're seeing a lessening of that trend — as you put it — of MIS directors wanting to deal directly with the company.

Why do you think that is?

Well, it's very clear that [MIS directors] want to have direct access to the company. They feel a need, and rightfully so, to have views in the future, to see how technology is going to evolve and to understand the product direction so that they can express their views and have them considered directly by the company. And again, they are seeing organizations like Businessland and some other retail chains providing a higher level of service, support and integration of third-party products that we, as a manufacturer of one product, can't provide.

So [users] can go to one place and get their MS-DOS machines, which they are still going to buy a lot of; and the Macintosh, which we hope they'll buy more of; software from Microsoft; and a network, possibly from 3Com or Ungermann-Bass, or ourselves. They can have all that put together and have training and support provided very economically and effectively by that dealer — [services] that we as a single-company manufacturer can't provide very well.

So we have to continue to provide large customers of our resellers [with] access to the kind of information and contacts within the company that they want, but also through those resellers, to have the availability of the service and support and system integration that they also want.

How many of these Fortune 1,000 accounts really need outside support? If they have the expertise in-house, all they'll care about is getting products cheaply.

First, out of our 75 corporate accounts, we have at least three right now that would prefer to deal with Businessland, for all the reasons I just mentioned.

Second, MIS budgets in large companies have not been overly expanded over the past few

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Ford system spots test faults in record time

Quest to save time and money leads to creation of airline fault-testing system

BY PEGGY WATT
CW STAFF

NEWPORT BEACH, Calif. — A microcomputer-based expert system is helping engineers in the aeroneutronic division of Ford Aerospace & Communications Corp. identify faults in airline systems tests — and doing it in half the time it took manually.

The new Fault Isolation System is particularly economical because it was written with the sub-$100 Turbo Prolog product from Borland International, rather than with a dedicated expert-system construction set, which can cost thousands of dollars.

In fact, the six-month experiment was so successful that developer John Chihorek recently received a $45,000 grant to turn his specific application into a generic expert system for Ford.

The project started as a quest to save time and energy spent in manual inspection and pen-and-paper fault finding, Chihorek says.

"I wanted an expert diagnostic system for a nonexpert technician to run," Chihorek, manager of software engineering for Ford Aerospace, explains.

'One-guy development effort'

Chihorek started building the system in October 1986 and put it to use in April. "It was a fast, one-guy development effort," he says. The finished product has 140 rules with about 120 conditions, some of them linked to several rules, which keeps memory requirements low enough to run the system on an IBM Personal Computer XT.

To operate the system, a user enters readings from forward-looking infrared pods and payload reports, which are tests of airline day-night (infrared) instruments. The test equipment readings help determine the instruments' proficiency.

The Fault Isolation System then flags unacceptable readings and traces the possible causes, which could include overheating, voltage or timing problems, Chihorek says. Cross-checks to determine whether one error led to another are built into the rules and used to trace errors back to their source. The user can do online updates and correct an erroneous diagnosis, immediately changing the rule from which the incorrect conclusion was drawn.

Chihorek says he hopes to eventually modify the system to directly receive instrument readings by radio frequency from the equipment being tested. With this in place, the user will not have to enter the data physically, he claims.

Supplements human evaluations

The Fault Isolation System is also being used to supplement human evaluations. "We use system engineers to validate the rule base and actually do testing," Chihorek says. Only one such system is in use now, but he says he expects it to be implemented at other Ford sites.

The system is running on an IBM PC AT, but Turbo Prolog's speed and memory requirements allow the program to run on less powerful systems.

Chihorek says he opted for Turbo Prolog because it permitted an inexpensive experiment and because he had been impressed with previous work with Turbo Pascal. "I'm pleased at how fast it went together," he says.

AI station

CONTINUED FROM PAGE 35

president of research and development for Gold Hill. "Until now, they could either build a serious expert system, which would run on specialized workstations, or build something less effective" for a PC.

Barber stated that an 8-MHz AT with Goldworks can achieve approximately 20% of the performance of a high-end dedicated AI workstation. He claimed that such a performance level is adequate in most instances.

Goldworks was demonstrated last Fall under the code name Acorn. Of the 50 beta-test sites so far, half are financially oriented institutions, Barber said. At those sites, Goldworks applications perform such tasks as the monitoring of brokers and loan reviewing.

The package comes with external interfaces to Lotus Development Corp.'s 1-2-3, Ashton-Tate's Dbase and the C programming language.

Goldworks is said to break the 640K-byte memory barrier imposed on most Microsoft Corp. MS-DOS-based applications by switching to the Intel Corp. 80286 or 80386 chip's protected mode to access extended memory.

Goldworks lists for $7,500. Bundled with Gold Hill's 386 Hummingboard accelerator board, the price is $13,300. Through the end of July, the respective prices for Goldworks and the Goldworks/386 Hummingboard package are $5,000 and $10,800. Goldworks requires at least 512K bytes of base memory, 5M bytes of extended memory and 7M bytes of space on a hard disk drive.

Moving 4Word

CONTINUED FROM PAGE 35

with spreadsheet applications, many users "live inside" 1-2-3 when using a personal computer.

Turner Hall Publishing Co.'s 4Word is a fully integrated add-in that gives 1-2-3 users a very capable word processor that will live inside 1-2-3 for only $99.95. Built with the Lotus Developer Tools, 4Word integrates with 1-2-3 more closely than Symphony's word processing does with its spreadsheet capabilities.

4Word's hot-link capability lets you place data from a 1-2-3 spreadsheet directly into 4Word documents. This is done by selecting ranges in the spreadsheet to be included in the document. While the spreadsheet remains the same, changes to the data in the spreadsheet, however, are immediately selected in the document.

Although it doesn't have all the bells and whistles of the most powerful dedicated word processing programs, 4Word is a full-function word processor. It not only offers basic word processing functions like word wrap, text justification and formatting, but also includes a wide range of more-advanced capabilities.

4Word also includes a mail-merge capability that can be used to create form letters, which works via 4Word's hot-link capability. Mail label and salutation data, for example, is kept within a row and column range of the 1-2-3 spreadsheet. 4Word prompts you for a data base range for the merge data.

Because 4Word is fully integrated with 1-2-3, it is able to use the printing capabilities of 1-2-3 directly. It therefore supports the same range of printers, using the same drivers as 1-2-3.

4Word is installed by a straightforward procedure that makes use of the Lotus 1-2-3 Add-In Manager. Utilities provided with 4Word are used to modify the 1-2-3 driver set to handle the enhanced text options of 4Word and to install the Lotus 1-2-3 Add-In Manager.

The latter is then used to install 4Word. You have the option of letting 4Word start automatically when 1-2-3 is started or invoking it manually when you want it.

The 4Word command menu may be used to restrict 4Word to a range of 1-2-3 cells within a column in the spreadsheet. In this way, you can be sure that 4Word documents are created using a section of the spreadsheet that will not interfere with normal spreadsheet operations.

4Word is typically called up by pressing a keystroke combination while in the spreadsheet. This puts you into a 4Word text screen. At this point you may enter text. To return to the spreadsheet you simply press Esc or the Alt-F9 combination. You are then exactly where you were when you left the spreadsheet.

All in all, 4Word provides an excellent, low-cost way for dedicated users of 1-2-3 to obtain powerful word processing capabilities without ever leaving 1-2-3. It delivers solid value that will be appreciated by many corporate users.

Zachmann is vice-president of research at International Data Corp.

Apple

CONTINUED FROM PAGE 35

years. That's our observation.

The ability to build a staff to provide that has been difficult for many companies, and many companies have said, "It's better not to take on the fixed costs of maintaining a large staff to go train everybody on word processing or data base or spreadsheet or different communications access technology. But we would really like to be able to pay somebody else to do that for us when we need it and as we need it."

That's a trend we're seeing happening very much. There are companies with hundreds, in some cases thousands, of microcomputers, who are coming in almost daily — they can't keep up with it. They also see that after you get over this initial wave of training, you don't necessarily want to have a huge staff left.

What's Apple's strategy for competing with IBM?

We are certainly not going in and saying 'Take out your IBM.' Our principal focus is to go into areas where we don't have to compete head on, or bit for bit or byte for byte, against IBM, DEC or anyone else.

We're saying 'Here's a machine that will exist with IBM and does some things differently and, we think, better.'

For example?

Publishing is clearly one. We've had significant success in the service industry where billable hours are their principal product, where an hour spent in training equals not only the cost of that hour, but a lost hour of revenue. So low training costs are important for firms like Peat, Marwick, Arthur Young and the audit department of Bank of America.

We're looking at expanding into engineering, where graphics, as well as strong productivity applications and the integration of those is very, very important. But selectively, so as not to ever be positioned 180 degrees at odds with IBM. We have already had tremendous success with McDonnell Douglas, Hughes, General Dynamics and virtually the entire list of aerospace and defense companies.

A lot of people are finding that the Mac works so well in that specialized area that maybe it's a good broad-based personal business computer.

Visicalc, 1-2-3

CONTINUED FROM PAGE 35

that are labels.)

Visicalc uses a straightforward designator: (L) for label and (V) for value. So the echo line in Visicalc might look like this: "B15 (L) January."

Compare this with 1-2-3, which took this label-value designation method and expanded it.

In 1-2-3, every cell that contains a label also contains one of four possible label prefixes (fill in here), which allow users to align the contents of an individual cell or a group of cells. This cell-alignment capability is available in Visicalc through the command G(lobal) F(ormat).

On to the menus. Both Visicalc and 1-2-3 invoke their menus by pressing the "/" key. After that, however, there are two differences between the programs.

First, in Visicalc we see a series of letters. Visicalc's main menu looks like this: BCDEFGIMPRSTUW-. Once the command has been invoked, by pressing the appropriate letter, the echo line in the status area displays the command word and necessary prompts.

Lotus, in a very effective attempt to be "user-friendly," displays words immediately after the user invokes the "/" key: Worksheet, Range, Copy, Move, File, Print, Graph, Data, Quit. But users can also execute 1-2-3 commands by pressing the appropriate initial.

The second difference is seen in the status area where the menus are displayed. Both programs have menus within menus. In 1-2-3, the user almost always sees two layers of the menus, which appear on the first and second lines of the three-line status area.

But in Visicalc, both menus and submenus are displayed on the second line, so the main menu disappears from sight as the user moves through the inner levels of the submenus. One other difference is seen in entering information into a cell: Lotus uses the second line as its entry line; Visicalc uses the third line.

In terms of the commands themselves, differences exist in order of execution as well as in terminology. For instance, the Visicalc Replicate command is called "Copy" in 1-2-3. It works the same way in both programs: The user is prompted for a Source (in Visicalc), or to (1-2-3) range, and prompted for a Target (Visicalc), or to (1-2-3) range. In both programs, users are free to type in the range addresses or to "point and highlight" the range with the cursor.

Lotus uses other commands also found in Visicalc including Delete (row or column), Format (a specific range of cells), Global (which includes Column width, Recalc and Format), Insert (row or column) and Window, and consolidates them within its main-menu command Worksheet. Worksheet controls operations that affect the entire worksheet. The keystroke sequence to insert a row in Visicalc is: /I(nsert) R(ow); in Lotus, /W(orksheet) I(nsert) R(ow). Command options involving an individual cell or a range of cells are similarly grouped within the Range command.

While Visicalc includes cell alignment (for both values and labels) as part of its Format and Global Format commands, Lotus pioneered the concept of the label prefix. In Lotus, one can not change the alignment of cells with values in them; rather, they automatically align to the right side.

Lotus added the Data and Graph commands, data base and chart-generation capabilities, which do not exist in Visicalc. These functions go beyond the core concept of the electronic spreadsheet.

In fact, within the Lotus 1-2-3 Release 1A manual there is an appendix that provides a chart of 1-2-3 equivalents for Visicalc commands.

Command options involving an individual cell or a range of cells are similarly grouped in both programs within the Range command. To format an individual cell in Visicalc, the keystroke sequence is /F(ormat) $; in Lotus, it is /R(ange) F(ormat) C(urrency).

While both similarities and differences between the product are apparent, it will be up to the courts to decide whether Lotus has illegally copied Visicalc.

Chaves is a PC training specialist for IDG Communications, Inc. and a Lotus 1-2-3 aficionada.

Program said to 'challenge intelligence'

BY DOUGLAS BARNEY
CW STAFF

A structured programming language available as shareware was announced by developer Dennis Baer of Farmingdale, N.Y.

The language, called Structured Programming Language, is a general-purpose language that translates to Basic and runs on IBM Personal Computers and compatibles, Baer said.

"This is for programmers, someone who has worked with Basic or doesn't like Pascal. This will challenge their intelligence," Baer said.

The product is available through PC-SIG, Compuserv, Inc. and The Source. Baer said he requests a donation of $50 to $100 if the user finds the software helpful.

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MSN-032-0387

NEW PRODUCTS

Systems

Anex Technology, Inc. has announced the **Multi-PC/3270**, an IBM Personal Computer AT-based multiuser microcomputer system with concurrent 3270 micro-to-mainframe communications for each user.

The product includes a 3274 cluster controller for eight 3278/3279 terminals, 3287 printer support, micro-to-mainframe file transfer and IBM PC-DOS applications software at each terminal.

The Multi-PC/3270 can be implemented with up to eight terminals on an Anex-supplied PC AT compatible. Terminals consist of IBM-compatible monitors and keyboard. They can be located up to 500 ft from the system.

An eight-user system ready for connection to an existing AT costs $12,245. With the Anex AT computer, it costs $14,495.

Anex Technology, 151 N. Route 9W, Congers, N.Y. 10920.

Software applications packages

AVL, Inc. has announced the **Shoview PC Projection System**, an LCD-based presentation system.

Shoview is said to allow users to project personal computer monitor screen output in a preprogrammed or real-time overhead presentation. It allows users to include any files created in Microsoft Corp. MS-DOS or IBM PC-DOS, including word processing, spreadsheets and graphics, in overhead presentations. The software allows a preselected show to run unattended, while allowing speaker override and control.

Features include 16 dissolve rates, 40- or 80-col. text and a file camera that grabs all or part of a file for use in the presentation.

Shoview is priced at $1,250.

AVL, 56 Park Road, Tinton Falls, N.J. 07724.

Software utilities

Price Engineering Co. has announced a **Fluid Power Symbols Library** for users of computer-aided design and drafting systems.

The Symbols Library is said to allow creation of hydraulic and pneumatic circuits. It features more than 600 schematic symbols ranging from basic directional valves to complex hydrostatic transmissions.

The library is priced at $240 including a reference manual with 5¼-in. diskettes for use with Autodesk, Inc.'s Autocad and Cadkey.

Price Engineering, 22577 Johnson Drive, Waukesha, Wis. 53186.

Lotus Development Corp. has reduced the price of its **1-2-3 Report Writer.**

1-2-3 Report Writer is a companion product for Lotus 1-2-3 and Symphony. It is said to allow users to generate customized reports and forms from data base files. It also simplifies and speeds-up the process of producing mailing labels from data base files.

1-2-3 Report Writer is now priced at $95. It is no longer copy-protected.

Lotus, Cambridge Pkwy., Cambridge, Mass. 02142.

Software enhancements

Index Technology Corp. has announced **Version 1.7** of **Excelerator** software for systems analysis and design.

Excelerator includes a graphics facility for developing and revising system diagrams and charts, an integrated dictionary and a paint facility for prototyping screens and reports prior to coding.

Version 1.7 offers the ability to function with the company's Customizer software to customize Excelerator's dictionary and its user interface. Additional enhancements include improved user interface features, improved support of data model diagrams and Constantine structure charts and additional analysis and reporting capabilities.

Excelerator runs on IBM Personal Computer XTs and ATs. It costs $8,400. Customizer costs $12,500.

Index Technology, 101 Main St., Cambridge, Mass. 02142.

ICS Computer Products, Inc. has enhanced its **Labtech Notebook** data acquisition and control program for IBM Personal Computers to support the ICS541 series analog and digital I/O cards and modules.

The ICS541 series is said to provide a means for the user to configure a mix of analog and digital I/O for an application, using only one or two slots in a PC, PC XT, PC AT or compatible.

Labtech Notebook allows multichannel data acquisition and display. It supports all the ICS541 modules. It costs $895.

ICS Computer Products, Suite 208, 5466 Complex St., San Diego, Calif. 92123.

Graphic Systems, Inc. has announced that the **Space Program**, its personal computer-based design and space-planning software, now links to Versacad Corp.'s Versacad computer-aided draft-

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Continued from page 39
ing and design system.

The Space Program performs stacking and blocking allocations and generates text and graphic cost estimates and space-accounting summaries. The bidirectional interface with Versacad allows users to transfer Versacad drawing files to the Space Program and Space Program-generated blocking allocations back to Versacad.

The Space Program costs $444.95.

Graphic Systems, 180 Franklin St., Cambridge, Mass. 02139.

Manufacturing and Consulting Services, Inc. has announced an enhanced graphics adapter (EGA) version of its **Anvil-1000MD** computer-aided design and drafting software.

The EGA version is a two-dimensional, eight-color system that runs on the IBM Personal Computer AT and compatibles. It features automatic calculation of dimensions, drawing manipulation and merging and advanced drawing-annotation features.

The EGA version of Anvil-1000MD costs $2,495.

Manufacturing and Consulting Services, 9500 Toledo Way, Irvine, Calif. 92718.

Training

Anderson Soft-Teach has announced two video-based training courses for IBM's Displaywriter 4 word processor: **Displaywrite 4: Mastering Word Processing** and **Displaywrite 4: Advanced Technique**.

Each course includes a personal training guide and practice disk and videotape. Each is available in VHS, beta and ¾-in. formats. Users are taken step-by-step through specific skills and are provided with hands-on exercises.

Topics covered in the first course include creating and revising documents, format functions, printing, the spelling dictionary and outlines. The advanced course includes form letters, headers and footers and combining documents.

The courses cost $275 each or $495 as a set.

Anderson Soft-Teach, 2680 N. First St., San Jose, Calif. 95134.

Board-level devices

Ariel Corp. has announced the **DSP-16**, a signal acquisition, synthesis and processing system contained on a single IBM Personal Computer plug-in card.

The DSP-16 is said to combine two channels of I/O conversion, a 256K-byte data buffer and Texas Instruments, Inc. TMS32020 digital-signal processing microprocessor.

The DSP-16 comes with the PC Sampler software package. The software package consists of a program development system and five software applications programs.

The DSP-16 costs $2,495.

Ariel, Suite 404, 110 Green St., New York, N.Y. 10012.

Profit Systems, Inc. has announced the **Elite 16** multifunction board.

The multifunction board features 16M-byte random-access memory expansion; Expanded Memory Specification support; support for 12- and 10-MHz IBM Personal Computer AT compatibles; true zero-wait state support in 6- and 8-MHz zero-wait state systems; two RS-232 serial ports and one parallel port.

The board comes with software said to determine the amount of conventional and extended memory in the system, determine the amount of memory installed on the board and determine the type of memory module in each bank of the board.

Elite 16 is priced at $695.

Profit Systems, 30150 Telegraph Road, Birmingham, Mich. 48010.

Tecmar, Inc. has introduced the **Captain 286** expansion board for the IBM Personal Computer XT 286, PC AT and compatibles.

The board combines multifunction features with extended memory support and expanded memory under the Lotus/Intel/Microsoft Expanded Memory Specification. Standard features include an IBM-compatible parallel printer port and an RS-232 serial port. Memory expansion up to 4M bytes is supported using 256K-byte single in-line memory modules. Using 1M-byte in-line memory modules, the board supports up to 15M bytes of extended memory.

The Captain 286 costs from $845 for the 512K-byte version.

Tecmar, 6225 Cochran Road, Solon, Ohio 44139.

Auxiliary equipment

Lutzky-Baird Associates has announced the **LBA voice annotation system** for use with its Ultra office-network productivity system.

The voice annotation system is said to provide the ability to add verbal comments to Apple Computer, Inc. Macintosh computer documents. The user's voice is picked up by a microphone and the signals are digitized and stored in the computer with the document for later incorporation. Users can comment on spreadsheets, graphs, drawings, data base material and word processing.

The LBA voice annotation system is priced at $150 for the Macintosh. An IBM Personal Computer version of the system is expected in June.

Lutzky-Baird Associates, No. 2011, 23801 Calabasas Road, Calabasas, Calif. 91302.

DATA STREAM

Elisabeth Horwitt

IBM buffers net lumps

Remember the story of the princess and the pea? How she came to stay one night in a castle, and they provided her with a bed piled high with about 20 mattresses, but she still woke up with a sore backside because there was this tiny pea at the bottom of the bed?

That story has some bearing on the communications strategy that IBM has unfolded during the past few months — particularly with its recent Systems Application Architecture (SAA) announcement.

IBM, the "perfect" host, would like to spare the user, or princess, any more pain from close contact with all of those incompatible, system-specific networking protocols (not exactly a pea, more like having a boulder in one's bed). The vendor proposes to install successive layers of networking software to act as buffers between the users and the lumpy realities of low-level networking.

Ever since establishment-wide networking (a term currently used by IBM spokesmen) became a major user priority and vendor selling point, all sorts of people have been taking pot shots at IBM for creating so many autonomous and incompatible computer lines. And now that IBM is earnestly trying to

Continued on page 47

Retailer shopping for ISDN

BY DONNA RAIMONDI
CW STAFF

ANAHEIM, Calif. — Integrated Services Digital Network (ISDN), the elusive service of the future that will allow MIS to blend its data, voice and video needs on one network, is a concept that a retail corporation here is taking very seriously.

Carter Hawley Hale Stores, Inc. is a centralized firm, devoted to one vendor in each area of importance — IBM for computers and AT&T for networking — and committed to integrating voice and data for its 18,500 terminal users, said James Rothenberger, manager of communications planning.

The company recently broke into two units: the Neiman Marcus Group, which includes Neiman Marcus, Bergdorf Goodman, Inc. and Contempo Casuals stores; and Carter Hawley Hale, which includes Broadway, Emporium Capwell Co., Weinstock's and Thalhimers stores.

"The real benefit of ISDN will be universal gateways to everything; it will replace voice, data, telex and other systems," Rothenberger said.

ISDN is a critical issue for Carter Hawley. It is something the company has been working on for some time and already has implemented as far as possible. The firm is increasingly using T1 lines and carrier services that promise to provide integration of voice, data and video as well as help migration to ISDN. It is also involved in ISDN product developments with AT&T and IBM under strict nondisclosure agreements.

Video in advertising

Carter Hawley said it eventually will use video for training and advertising, and the video will be integrated with voice and data, management and security features on the T1 lines the company is installing initially in Southern California. Carter Hawley has already started to drop its private networks in favor of connectivity to AT&T's central offices. By doing so, the firm will be able to take advantage of virtual networks, like AT&T's Software Defined Network, a precursor for ISDN, Rothenberger explained.

"We will hook into AT&T eventually. As a national company, we have to hook into AT&T so we will have the same interfaces nationwide," Rothenberger said. Each divested Bell operating company has its own idea of ISDN, but each is proprietary and will not interface cross-country, he added.

On the application level, Carter Hawley is developing one payroll and accounting system. The firm also is integrating voice and data where possible and developing centralized network management and security.

Upgrading to ISDN will create problems in keeping up with the speed of technological changes, Rothenberger said.

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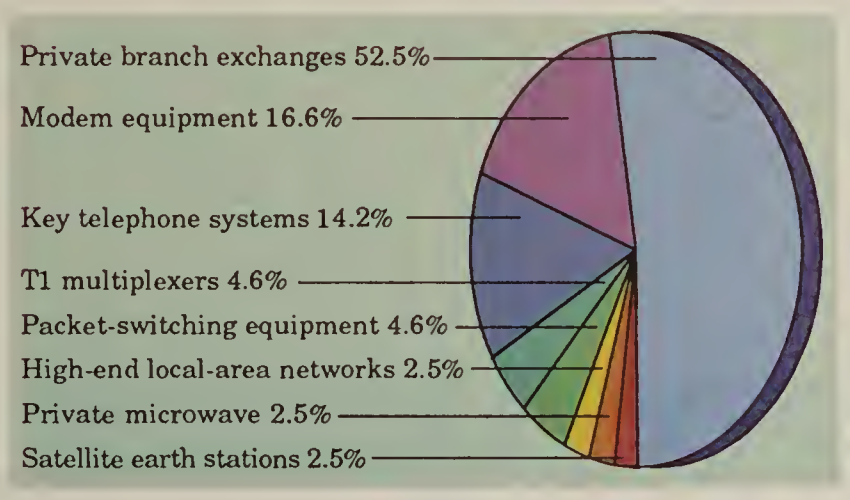
Data View

1986 telecommunications equipment budget

Private branch exchanges account for more than half the $16.635 million U.S. businesses spent last year



INFORMATION PROVEDED BY SALOMON BROTHERS, INC.
CW CHART

BIT BLAST

Firms unite to conquer

Network Innovations Corp. and **Sequent Computer Systems, Inc.** have announced an agreement whereby a version of **Network Innovation's Multiplex** link between IBM Personal Computers and relational data base management systems will run on Sequent parallel computers. Multiplex integrates PC applications based on Microsoft Corp.'s MS-DOS into AT&T's Unix relational data base systems, such as Oracle Corp.'s Oracle, Relational Technology, Inc.'s Ingres, Informix Software,

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Linkware adds VTAM to PC link

BY ELISABETH HORWITT
CW STAFF

WALTHAM, Mass. — A VTAM-based micro-to-mainframe link recently introduced by Linkware Corp. helps MIS managers improve response time and avoids contention problems on the host, the vendor claimed.

A new version of the existing Linkware Information Server allows users to access files on IBM MVS and MVS/XA systems through a direct link to VTAM. The product includes a VTAM host-based file management program and the Linkware PC Connection, which communicates with the host program in order to provide file transfer, terminal emulation and data transfer capabilities.

By interfacing directly with VTAM rather than with telecommunications monitors such as IBM's CICS or TSO, the information server reduces the mainframe work load and speeds up response time, according to Linkware.

Shearson Lehman Brothers, Inc.'s Commercial Paper unit has been using the older version

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Inside

INTRODUCING THE
YOU WON'T BELIEVE
TO THE AVERAGE

Fasten your seatbelts. The new Pinwriter® P9XL printer from NEC is about to take off.

It's our fastest printer yet.

Actual print sample from the Pinwriter P9XL printer.

It cruises at 400 characters per second in draft mode, 140 characters per second in letter quality mode.

Which means it can really make those business letters fly. In fact, no other 24-pin printer is faster.

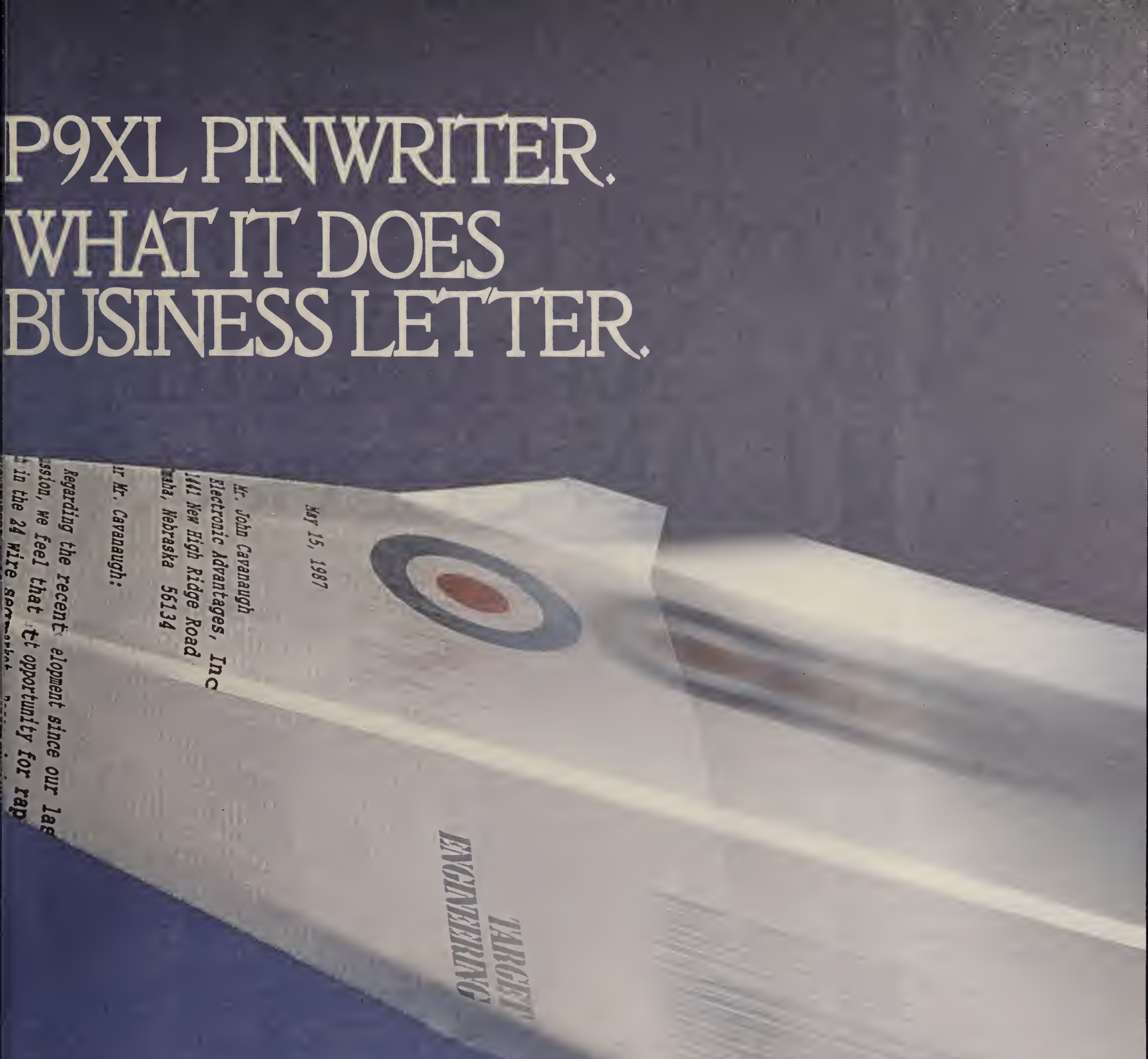
And because it uses a 24-pin printhead and a multistrike film ribbon—the same kind that's used in typewriters and letter-quality printers—the P9XL also delivers better print quality than its competitors. It even prints in color.

But it's not limited to letters. The Pinwriter P9XL is a true multi-purpose printer that can fly through payroll, invoices, continuous forms, multipart forms—just about any business or office application.

Best of all, it's from NEC—the world's largest

C&C Computers and Communications

P9XL PINWRITER.
WHAT IT DOES BUSINESS LETTER.



manufacturer of 24-pin printers. The company that consistently offers you the highest reliability ratings in the industry. (You can expect your P9XL to run for five years before it might need a repair.)

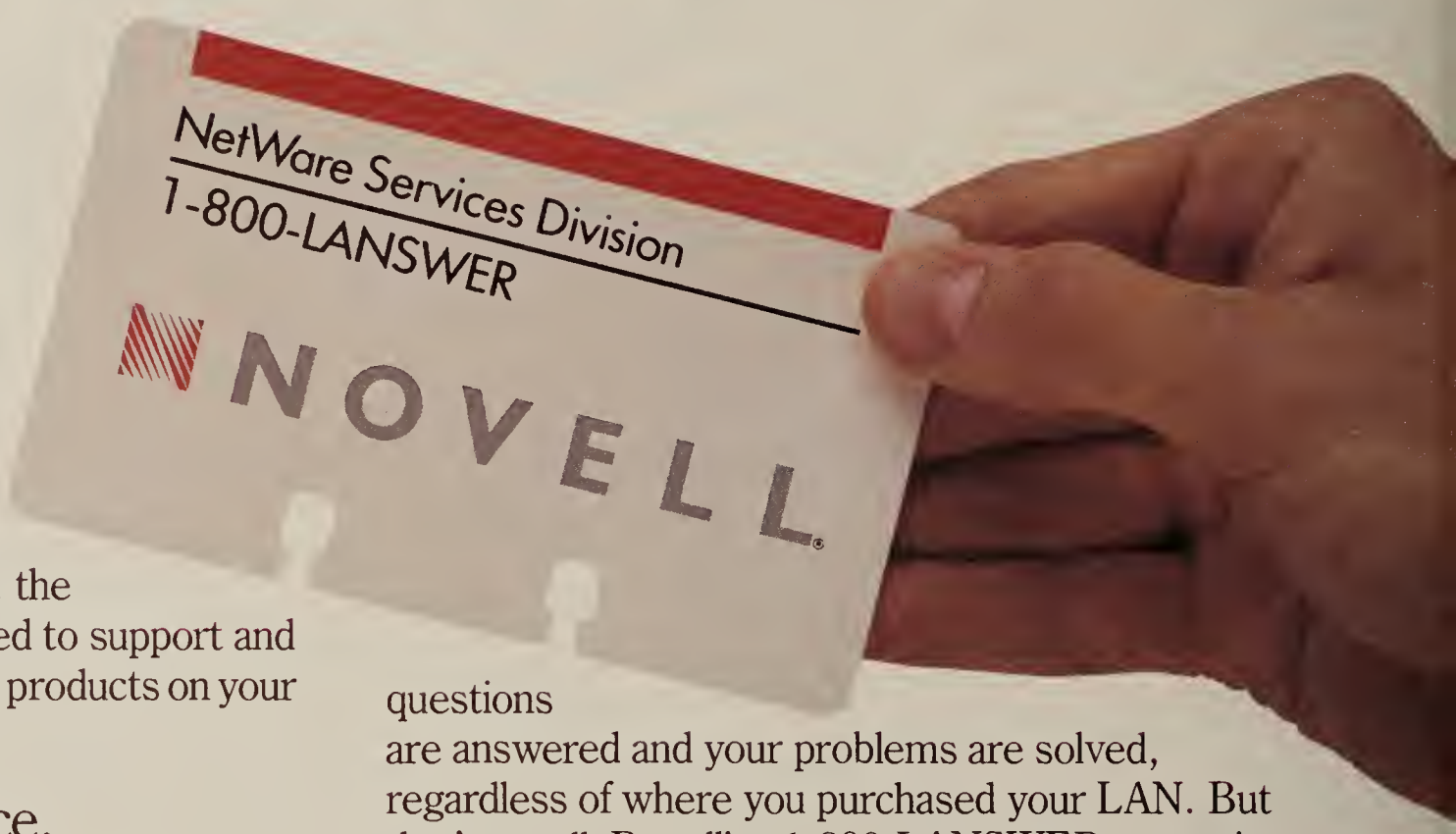
So don't waste any more time. Fly down to your nearest dealer and ask to see the new Pinwriter P9XL. Or call NEC at 1-800-343-4418 (in MA, (617) 264-8635). Or if you prefer, write to NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

NEC PRINTERS. THEY ONLY STOP WHEN YOU WANT THEM TO.

NEC

NEC Information Systems, Inc.

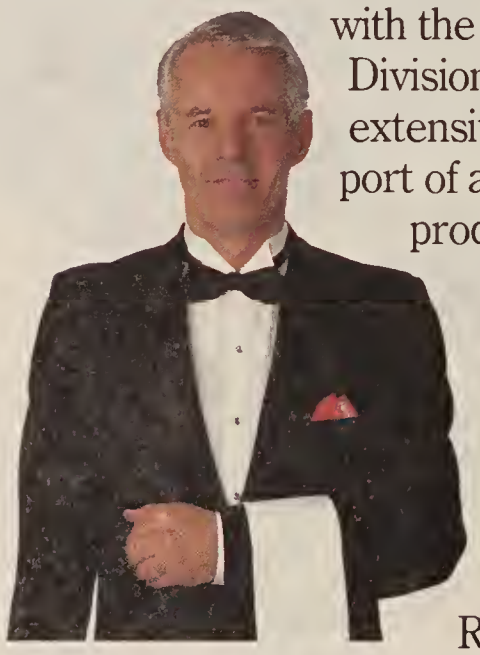
Novell Has A New Calling Card For LAN Service.



Our new calling card has one aim—to help you call on us when you have a question or problem with a LAN product. One phone call will put you in touch with our NetWare® Services Division, the branch of Novell expressly created to support and service all hardware and software products on your NetWare LAN.

At Your Service.

Novell dedicated years of hard work to the development of the networking industry's most innovative, high-performance LAN products. And with the NetWare Services Division, Novell has dedicated extensive resources to the support of all hardware and software products on NetWare LANs.



First-class service for your first-class LAN.

Always on Call.

When you call 1-800-LANSWER, anytime, day or night, you'll reach a NetWare Service Representative. The Service Representative will see to it that your questions are answered and your problems are solved, regardless of where you purchased your LAN. But that's not all. By calling 1-800-LANSWER, you gain access to the full range of services provided by the NetWare Services Division. Services like our 24-hour toll-free number, technical telephone support, on-site technical support and attractive service agreements.

The Call To Action.

The NetWare Services Division has been called into action to meet the service and support needs of NetWare users everywhere. So if you have a question or problem concerning products for your NetWare LAN, contact the NetWare Services Division at 1-800-LANSWER. The number is staffed around the clock. And remember, the call's on us.

NOVELL®

Milestones Ahead.

DEC debuts voice response system, LAN link

BY DONNA RAIMONDI
CW STAFF

An integrated computer system that enables users to access data bases via telephone and a tool to link and manage multiple networks were introduced last week by Digital Equipment Corp.

The Dectalk Voice Response System, based on the Microvax II, allows users to access data bases via AT&T Touch-Tone telephones. It can be used as a stand-alone unit or as a front-end system to large corporate data bases on any computer system that can be accessed via a DEC network.

The system can be networked using Decnet software and DEC's Ethernet hardware so that users can access resources of other computers on the network. It can be included in the low-end local-area Vaxcluster, and while the system cannot reside in a high-end Vaxcluster, it can be bridged to one via networking options, a spokesman said.

The Dectalk stores data in ASCII format and reads it out over the telephone. The $40,000 basic unit supports two to eight Dectalk channels and has 5M bytes of main memory, a 71M-byte 5¼-in. Winchester disk, a cartridge streaming tape drive, eight- and four-line interfaces and a video terminal.

It can be upgraded to support up to 32 Dectalk lines. The maximum upgrade price is an additional $121,500, but there are intermediate upgrades, a DEC spokesman said.

DEC also released its Metrowave bridge, which links multiple geographically separated Ethernet local-area networks (LAN) using a 23 GHz microwave link at the full Ethernet speed of 10M bit/sec.

The Metrowave is similar in function to DEC's LAN Bridge 100, but in a campus-like environment it can connect Ethernet segments residing in separate buildings up to a distance of 4½ miles, or 7,340 meters. The LAN Bridge 100 links adjacent Ethernet segments within buildings inside an area of 22,000 meters.

The DEC portion of the system costs $28,000 for both ends of a link-in cabinet configuration packages. M/A-Com, Inc., through a joint marketing agreement with DEC, supplies the necessary microwave radio equipment for additional costs.

The Metrowave bridge automatically detects and adjusts to network configuration changes — such as a node disconnected and reconnected in another segment of the LAN. By keeping local traffic local and passing over the bridge only those messages addressed to remote users, Metrowave provides more efficient use of network resources.

Server allows users to share IBM gateway

BY ELISABETH HORWITT
CW STAFF

FOSTER CITY, Calif. — Up to eight IBM Personal Computers or compatibles can gain access to a dial-up host connection through Clusternet II, a network server recently introduced by Intelligent Technologies International Corp. The vendor also announced the Gateway Exchange Communications System, which converts one or more PCs into a Systems Network Architecture (SNA) gateway on an IBM Netbios local-area network (LAN).

The Clusternet II expansion board and software convert an IBM PC into a nondedicated server emulating an IBM 3274 Cluster Controller, the vendor said. The server can support up to eight PCs accessing an SNA host via a remote dial-up or leased-line link at up to 9.6K bit/sec. PCs are attached to the server via an RS-422 serial link over four-wire shielded cable at speeds of up to 19.2K bit/sec.

The product was designed to be an inexpensive alternative for small corporate sites that cannot justify either a 3724 or a LAN, noted John Dougherty, Intelligent Technologies' president.

Converts PCs into controllers

Based on the same server hardware as Clusternet II, the Gateway Exchange Communications System converts a PC into an IBM 3274/6 Cluster Controller on a Netbios LAN. Workstation PCs connected to the LAN can access remote hosts by emulating IBM 3278, 3279 or 3180 terminals, the vendor said.

Both Clusternet II and Gateway Exchange have built-in diagnostic features that include a line monitor, a session status routine that continuously checks the server for error events and a statistical report generator.

A Clusternet II configuration that links two PCs to a remote IBM mainframe is priced at $1,795. Upgrade kits cost $349 per workstation.

A Gateway Exchange Communications System configuration supporting 16 mainframe sessions across the network is priced at $1,995. The 64-session configuration is priced at $3,495. The product is scheduled to be available in May.

Firms unite

CONTINUED FROM PAGE 41

Inc.'s Informix-SQL and Unify Corp.'s Unify.

A melding of computer and data private branch exchange power is the goal of a recently formed partnership between **Data Voice Solutions Corp.** and **Gandalf Technologies, Inc.**

The two companies intend to jointly develop products that will harness Data Voice Solution's Centaur, a multiuser computer system that is compatible with Microsoft Corp.'s MS-DOS, to Gandalf's Private Automatic Computer Exchange Network. Gandalf's network is commonly used to link multiple terminals to host computers.

The idea is "to give terminal users both PC and networking capabilities," the companies said.

Procter & Gamble Co. has tapped **BBN Communications Corp.** to supply the packet-switching equipment for a major private network installation that the retail giant is planning. The network will connect Procter & Gamble's corporate data centers in Cincinnati with national and international manufacturing plants and sales offices.

No details were available on the size of the purchase, but it includes packet switches, packet assembler/disassemblers, the Network Operations Center and Network Access System.

IBM has reportedly ensured that upon purchasing one of the new Personal System/2s, customers can immediately start using it to communicate bisynchronously with mainframe hosts.

Prior to the PS/2 announcement, IBM allowed **Micro-Integration, Inc.** to test its Microtam line of bisynchronous control PC-to-mainframe communications products on the PS/2, the software vendor reported.

With the release of the PS/2, Micro-Integration began selling an upgraded, 3½-in. disk version of BIS-3270, which provides bisynchronous communications for IBM's new microcomputer line.

An IBM Personal Computer version of BIS-3270 is currently being sold by IBM under its own label.

Codex Corp. has joined the throng of T1 switch vendors that are providing a link between their proprietary products and Digital Access and Cross-Connect System (DACS), the gateway to AT&T's networking services such as Accunet, Customer Controlled Reconfiguration and Megacom.

Codex's recently introduced DACS Services Access, an optional software enhancement for the 6240 T1 multiplexer, allows 6240 users to interface directly with DACS-based AT&T services via a T1 link.

National Semiconductor Corp. and **Celerity Computing** are planning to port their minicomputer systems onto **Digital Equipment Corp.'s Decnet** through a software package from **Technology Concepts, Inc.**

Both companies recently obtained licenses to resell Technology Concepts' Community, a software product that implements Decnet on non-DEC systems.

A Sudbury, Mass.-based subsidiary of Bell Atlantic Corp., Technology Concepts was founded by Decnet architect Stuart Wecker. Other Community licensees include Unisys Corp., Sun Microsystems, Inc. and Elxsi.

Harris offers E-mail, Disoss gateway link

BY ELISABETH HORWITT
CW STAFF

DALLAS — Following in the footsteps of Digital Equipment Corp., Hewlett-Packard Co. and Wang Laboratories, Inc., Harris Corp. announced a gateway between its own host-based electronic mail system and IBM's Distributed Office Support Systems (Disoss).

Through Disoss gateway software developed by Harris's National Accounts Division, users on the Harris 9300 network communications system can exchange mail with Disoss-compatible systems including the IBM System/36, 38 and Displaywriter, DEC VAX, HP 3000 and Wang VS, Harris said.

The gateway communicates with Disoss using IBM networking protocols such as Systems Network Architecture Distributed Services, Advanced Peer-to-Peer Communications and LU6.2. Messages are converted to the IBM document formatting protocol, Document Content Architecture.

The Disoss gateway can be accessed by personal computers attached to a Harris local-area network and by users of remote 9300s connected via Harris's electronic mail program. Harris's Perspective forms the common user interface for both the 9300-based electronic mail system and Disoss.

The Harris 9300 communications system supports personal computers, ASCII terminals and IBM 3270 terminals.

The Disoss gateway is priced at $2,995. The gateway is available immediately.

There's only one way to keep on top in the terminals business.

Keep on topping yourself.

WYSE


File Tools Selector Patterns Font Style
Calculator
Clock
Print Spooler
ABC
Executes the Undo
Hold down while us
the pixel you clic
complement color
WYSE

Presenting the Wyse WY-60.

It's a better ASCII terminal. A better ANSI terminal. And a better PC terminal.

The WY-60: multiple personalities, but character that's singularly Wyse. It's the best example yet of the ingenuity and attention to detail that put Wyse on top in the first place. A terminal designed to work better, above all, for the people who work with it.

Consider how it works better for their eyes. Sharp 10 x 16 characters create extraordinary resolution. Since lighting—and taste—varies, so does our selection of screen colors.

Now consider how the WY-60 works better to organize data. Its 132-column x 44-line format displays an entire spreadsheet. We give you double-high, double-wide characters for headings and highlights. A 512-character soft font to download specialized symbols and graphic images. And hidden attributes to simplify displays and save screen space.

And the WY-60 fits into most any environment. It emulates 20 different personalities, from IBM-PC to Unix and the DEC VT-100.

Our optional arm elevates your point of view.

So no one has to re-learn a keyboard, you can choose from five popular layouts: ASCII, ANSI, IBM Enhanced PC, IBM AT, or IBM 316X. Each keyboard features the precise and resilient feel perfected by Wyse for more efficient touch typing. And because people simply *like* it.

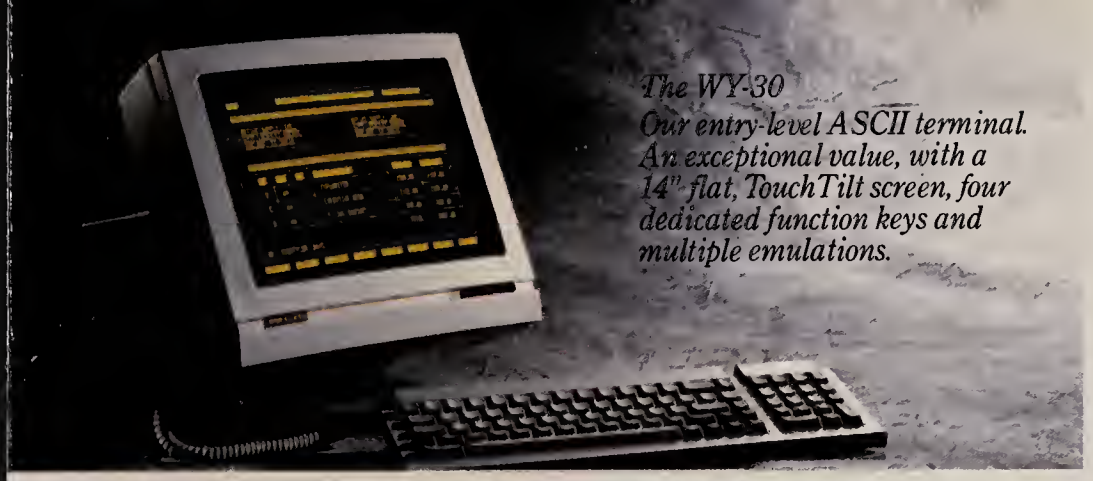
No small consideration. People simply *like* working with the WY-60. They like its looks. The ease with which it tilts, swivels or elevates. They appreciate WyseWorks, our built-in calendar, clock/alarm, calculator and ASCII table. And Wordstar users enjoy the reduced key strokes our integrated Wyseword firmware provides.

What's white and amber and green? The WY-60's screens.

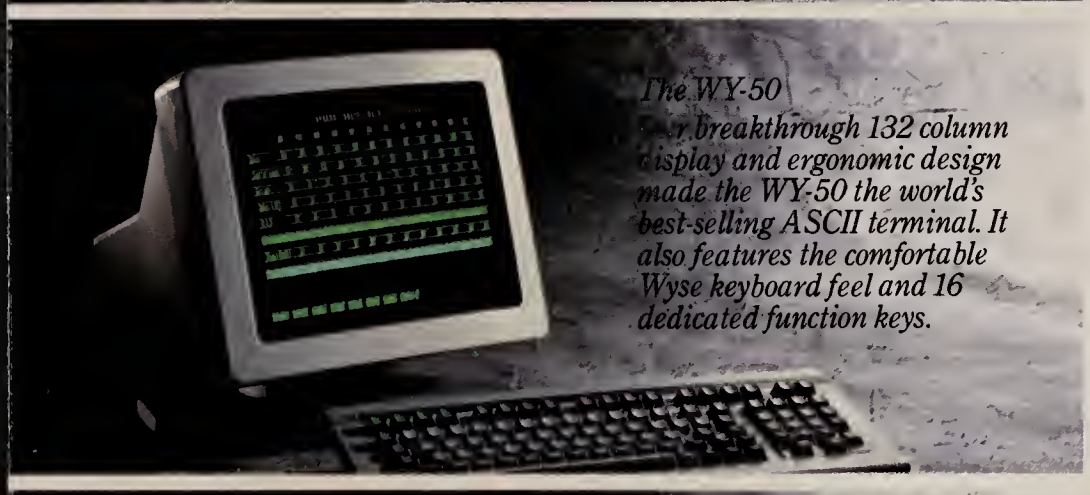
The WY-60 is as comfortable to invest in as it is to work with. With quality backed by the company that ships more terminals than anyone but IBM, and the most comprehensive service and support program in our industry.

Key decision: which of five WY-60 layouts to choose?

At Wyse, we believe you don't get to the top in the terminals business without building a solid foundation.

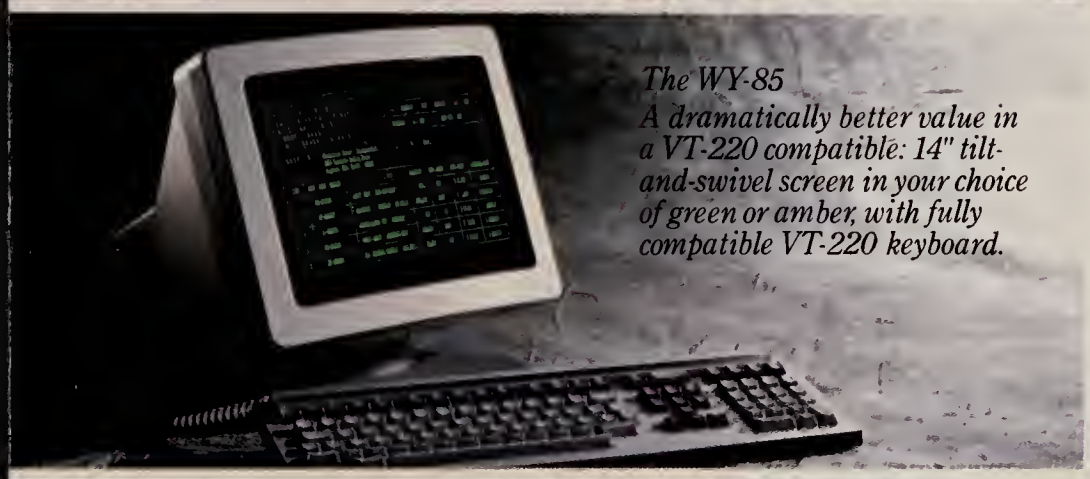


The WY-30
Our entry-level ASCII terminal. An exceptional value, with a 14" flat, TouchTilt screen, four dedicated function keys and multiple emulations.

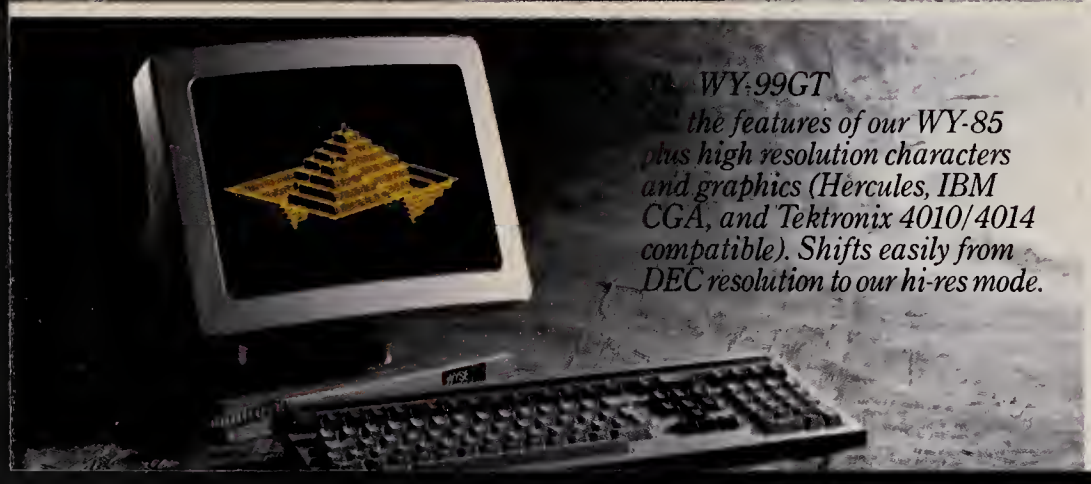


The WY-50
Our breakthrough 132 column display and ergonomic design made the WY-50 the world's best-selling ASCII terminal. It also features the comfortable Wyse keyboard feel and 16 dedicated function keys.

The WY-350
This is the color version of our best-selling WY-50. Its big screen and range of 64 colors make complex data easy to read.



The WY-85
A dramatically better value in a VT-220 compatible: 14" tilt-and-swivel screen in your choice of green or amber, with fully compatible VT-220 keyboard.



The WY-99GT
All the features of our WY-85 plus high resolution characters and graphics (Hercules, IBM CGA, and Tektronix 4010/4014 compatible). Shifts easily from DEC resolution to our hi-res mode.

The top line.

You're looking at five of the reasons Wyse ships more terminals today than anyone but IBM.* But the most important reason of all, we think, is the way we build every one of our terminals. Virtually from the ground up. With unwavering insistence on reliability, value, and integrity of design. No short cuts. No compromises. Because we know the best way for you to get more work out of a terminal is for us to put more work into it. And that increased productivity is the most important value of all.

Call today or mail the coupon. And see what the terminal industry's top line can do for your bottom line. **1-800-GET-WYSE.**

*IDC 1986 U.S. Terminal Census.

____ Yes, please send me detailed information on the WY-60 and the entire Wyse product line.
____ I'd like to see a demonstration of the WY-60.

Name_____
Title_____
Company_____
Phone_____
Address_____
City_____ State____ Zip____

Mail to: Wyse Technology,
Attn: Marcom Department 60-4p
3571 N. First Street, San Jose,
CA 95134

WYSE

We make it better, or we just don't make it.

IBM buffers

CONTINUED FROM PAGE 41

fix the problem, it is being faulted for taking so long.

Most fair-minded consultants admit that IBM has a mammoth job ahead and that the vendor is working hard at creating a transparent, user-friendly establishmentwide networking system for users and programmers alike.

One of the first breakthroughs was the introduction of LU6.2, a peer-to-peer networking protocol that provides a consistent way for different IBM systems to communicate across a wide range of communications links. Unfortunately, from a programmer's point of view, LU6.2 does not provide a consistent applications interface across different systems — and developing such applications still requires generating a bunch of system-specific code.

DDM designed to buffer user

IBM, realizing this, has introduced protocols designed to buffer the user — and the application programmer — from LU6.2. One major mattress of this type is Distributed Data Management (DDM), a "common, system-independent structure that allows application programs running on one system to access data files residing on another system," according to IBM.

The product is billed as a way to solve the classic programmer's dilemma, as IBM states in a systems integrator's brochure: "If you want to share data among systems, you might use Cobol . . . and write a pair of programs that talk to each other. Of course, if anything changes on the systems, the programs must get changed. . . . Soon you have a lot of communications applications." With DDM, programmers ideally can write an application once, and whatever changes are made on the networking level do not affect that application.

But IBM does not stop there. On top of DDM there is Enhanced Connectivity Facility (ECF), which currently defines a set of program-to-program communications functions for micro-to-mainframe links but is evolving into an umbrella architecture for distributed processing, some analysts say. That umbrella will provide much of the underlying communications functionality for R Star, IBM's much-heralded distributed relational data base management system.

By this time, the princess may be feeling a bit dizzy, situated as she is on top of a bunch of mattresses labeled LU6.2, DDM and ECF — not to mention the common user interface that IBM promises will run across all of its systems.

And users' insecurity has been heightened by the fact that these layers are far from stable or complete. LU6.2 is still a long way from replacing older 3270 terminal-oriented Systems Network Architecture protocols on the PC-to-host side — or Netbios in the PC local-area network domain. The current version of ECF uses the 3270-PC data stream, not LU6.2. And IBM has yet to introduce a VTAM version of LU6.2.

Stray products around

Meanwhile, there are several stray products floating around that may or may not be blessed by IBM as part of the SAA architecture.

Advanced Program-to- Program Networking (APPN), for instance, is an LU6.2-based program that allows a PC application to access data on a System/36 through several intermediate System/36 nodes.

IBM has hinted that a 370 version of APPN is forthcoming — which would provide yet another way for applications on IBM's three major product lines to talk to each other across a distributed network.

Is it necessary?

Doubtless this will be cleared up in IBM's own good time. One remaining question, however, is: Are all of those layers really necessary in order to protect the princess from the pea?

It goes beyond aesthetics (that is, the awkwardness of a towering pile of mattresses), to practical considerations such as: What is response time going to be like on a distributed network in which each query must go through LU6.2, DDM, ECF, plus a relational data base management system? And how many users can even a full-grown Personal System/2 support as distributed file server, if it has to run all of this stuff?

This is not a rhetorical question, IBM. I really would like an answer.

Horwitt is *Computerworld's* senior editor, networking.

Retailer shopping

CONTINUED FROM PAGE 41

"By the time you put it in, it's obsolete. The technology is never finished. For instance, T1 equipment vendors are making leaps over each other all the time, but I want to see the products, not the promises," he added.

T1 clocking issues caused Carter Hawley to drop MCI Communications Corp. as a vendor, Rothenberger said. "We had MCI, AT&T and Pacific Bell T1s, and we ran them into the PBX. MCI wouldn't go."

Easier to deal with one vendor

Differences in the clock time of the private branch exchange (PBX) and the T1s caused noise and loss of conversations, sometimes for a half or full second, up to several hundred times per hour. Problems like these reinforce Rothenberger's view that it is easier to deal with one vendor whose equipment will work, even if it is not on the leading edge of technology, he said.

The management of voice and data networks is critical to future success with ISDN, Rothenberger said. "You have to start monitoring voice and data or you will fail."

With separate voice systems, lines can fail without anyone noticing. But when ISDN comes with a single universal gateway to voice and data, if the lines fail, "you'll go down and be out of business if you don't have them managed the same way," Rothenberger said.

Carter Hawley will soon start managing voice centrally, probably using AT&T's Call Management Systems software on AT&T's 3B5 processor, he added.

While ISDN services are still in the future, it is imperative for MIS to become involved now, Rothenberger said. "Standards development is critical. We are the only user corporation in the General Interest Group of the T1 committee," he said.

Corporate users who do not get involved will have no input into developments. The other members of the committee are vendors, manufacturers and government agencies. "There should be more corporate users [involved] if they want to have a say in the future," Rothenberger stated.

MIS should also be merging with voice communications for control of the networks.

"Whether the voice or data people take over doesn't matter, but it has to be together," Rothenberger stressed.

MIS managers should beware of affecting response time while implementing new technologies, and they should also be prepared to retrain personnel in new techniques for using the networks, if necessary, he added.

Linkware

CONTINUED FROM PAGE 41

of the Linkware Information Server for approximately two months. The organization recently installed the VTAM version "because it provides increased resource efficiency," compared with the TSO- or VM-based product, explained Mervin Adrian, who is a project manager for the unit.

"With TSO or VM, a lot of memory must be allocated for each user that is logged on," he said.

Additionally, the VTAM-based system allows users to download data "without drawing from the TSO resource pool or contending with TSO users, unless you happen to be simultaneously going against the same file," Adrian noted. "And even then it isn't a problem unless you are downloading a long file."

The only drawback of the new Linkware product is that it does not provide direct access to VM files, Adrian said. "Nothing but VM can get VM — that's the way IBM built it," he added.

Working on access to VM files

However, Shearson's systems personnel are working with Linkware to provide access to VM files through the VTAM-based system, probably through a program that transfers VM files to MVS, Adrian speculated.

The Linkware Information Server for MVS and VTAM supports existing security systems such as RACF and ACF2, eliminating the need for MIS managers to define and maintain additional logon and identification names as in TSO systems, Linkware said. The product is priced at between $11,075 and $35,000, depending on system configuration. PC software is priced at $300.

NEW PRODUCTS

Local-area network hardware

Network Systems Corp. has introduced its **3270 Multiswitch** for users of IBM 3270 or asynchronous-type terminals.

The 3270 Multiswitch is said to provide users access from a 3270 terminal to multiple hosts, connections between 3270-type terminals and asynchronous hosts and sharing of controllers, modems, asynchronous ports and other resources by many terminals.

Users can establish connections directly to multiple hosts without requests to a central data center. One Multiswitch supports up to 96 connections, depending on the mix of terminals, controllers and hosts. Multiple switches can be connected locally via fiber-optic or coaxial cable.

The 3270 Multiswitch is priced at $32,700.

Network Systems, 7600 Boone Ave. N., Minneapolis, Minn. 55428.

Evered Enterprises, Inc. has unveiled the **E²-200 Multidrop System**, an RS-232C communications network for personal computer-based data collection in distributed manufacturing environments.

Up to 16 serial devices can be connected to a single cable, which can span up to 4,000 ft, the vendor said.

Bar-code readers, data entry keypads, display terminals and computer-based test stations can be networked to provide a data collection system.

The network operates at rates up to 19.2K bit/sec.

The E²-200 Multidrop System is priced at $795 per point.

Evered Enterprises, 15811 8th Ave. N.E., Seattle, Wash. 98155.

Local-area network software

Waterloo Microsystems, Inc. has announced that its **Port** personal computer local-area network (LAN) program is now available for the IBM Token-Ring network.

The Port PC LAN program enables IBM PCs, PC XTs, ATs and compatibles on an IBM Token-Ring network to share file, printer and communication resources. Each PC on the Port LAN requires an IBM Token-Ring network PC Adapter.

Not only can a Port LAN contain dedicated servers but it also gives the user the option of using nondedicated servers and supporting distributed services with multiple servers.

Port features include network management, security and the ability to run application programs written for IBM's Netbios and PC-DOS.

The base price of the Port PC LAN program is $1,695.

Waterloo Microsystems, Suite 200, 3597 Parkway Lane, Norcross, Ga. 30092.

Aegis Development, Inc. has announced **Diga**, a telecommunications software program for Commodore Business Machines, Inc.'s Amiga personal computer.

Diga is said to use a packet system to send and receive information. It confirms file integrity after a transmission and receives any needed correction. Batch-file transfers are simplified with a file-select/deselect toggle.

Other features include a terminal program that allows users to create custom emulations, automated sessions and the ability to perform remote operations with password protection. Diga uses the vendor's Doubletalk file-transfer capability.

Diga is priced at $79.95.

Aegis Development, 2115 Pico Blvd., Santa Monica, Calif. 90405.

Rabbit Software Corp. has unveiled the **3770 Station-Plus**, an IBM 3770 Remote Job Entry (RJE) software package for its Micro Plus MP14 and MP24 IBM Systems Network Architecture adapter products that work with the IBM Personal Computer family.

The 3770 Station-Plus can be used for stand-alone RJE applications, coupled with Rabbit's 3270 remote workstation products and installed on an IBM Netbios-compatible local-area network. The package emulates a 3770 console, 3770 card reader, 3770 card punch and up to three 3770 line printers.

The 3770 Station-Plus costs $395.

Rabbit Software, Great Valley Corporate Center, 7 Great Valley Pkwy. E., Malvern, Pa. 19355.

Network management

Infotron Systems Corp. has extended its line of **INM Integrated Network Managers** and enhanced the products' network management and control capabilities to support the firm's Infostream Network Exchanges and INX Intelligent Switching Systems.

The INM 400 provides single-point management and control capabilities for medium-size networks. It supports up to 1,600 channels at speeds of up to 9.6K bit/sec. The INM 1000 provides network management and control features for large networks. It supports up to 4,000 channels at speeds of up to 9.6K bit/sec.

Control capabilities of the network managers include detection of problems,

Continued on page 50

SUGAR INDUSTRY FINDS CHEAP SUBSTITUTE

Avatar changed the rules.

Substitutions are now allowed.

A major sugar company found that out when they got a taste of the Pro-87 Coax Adapter.

The Pro-87 allowed them to emulate the 3287 using their Proprinters. And save up to 75% over comparable IBM 3270 equipment in the process.

That made the idea of outfitting all of their offices with mainframe printers a lot easier to swallow.

And the Pro-87 is easy to handle. Because it's a board that fits right inside any IBM Proprinter.

So maybe your Proprinter isn't a 3287. But with the Pro-87, it sure can act like one.

Avatar Technologies Inc.
99 South Street,
Hopkinton, MA 01748.

Avatar. All you need to know about 3270 connectivity.

617 435 6872

Avatar

Continued from page 48
fault isolation and service restoration.

The INM 400 costs $38,000. The INM 1000 costs $48,000.

Infotron Systems, Cherry Hill Industrial Center-9, Cherry Hill, N.J. 08003.

Comdesign, Inc. has announced the **Network Assistant**, an IBM Personal Computer AT-based network manager for the vendor's Futurecom systems.

Network Assistant is said to allow the systems manager to access an entire network via a centralized data base and reporting facility. It provides event and alarm logging, dynamic configuration and monitoring and data base management. The product can be customized to meet specific management requirements.

Network Assistant is priced at $2,500 for the first license per network.

Comdesign, 751 S. Kellogg Ave., Goleta, Calif. 93117.

Links

Netlink, Inc. has introduced **Bisync SNA Gate** for interfacing bisynchronous devices to Systems Network Architecture (SNA) networks.

The Bisync SNA Gate is said to provide up to eight ports for interconnection of bisynchronous devices to SNA networks over direct, leased, multidrop or dial-up lines. It accommodates up to two 9.6K bit/sec. lines or six 4.8K bit/sec. lines.

According to the vendor, Bisync SNA Gate permits customized configuration to support a variety of bisynchronous terminal personalities and has the ability to support different protocols concurrently. It also allows centralized network management control.

Bisync SNA Gate is priced from $4,500.

Netlink, 3214 Spring Forest Road, Raleigh, N.C. 27604.

Protocol converters

PCI, Inc. has introduced **Smartnet 5250/T**, a protocol converter said to connect up to seven asynchronous devices to the twin-axial port of IBM System/34, 36 and 38 minicomputers.

Smartnet 5250/T connects terminals, personal computers, printers and graphics devices. It supports more than 45 common asynchronous terminal types, including the IBM 3161, 3162, 3163 and 3164 and the Digital Equipment Corp. VT100 and VT220. Video and editing support are provided, enabling the user to connect 132-col. by 27-line asynchronous displays to emulate IBM 3180 Model 2 terminals. The converter also provides seven-color support.

Smartnet 5250/T is priced at $4,950.

PCI, 26630 Agoura Road, Calabasas, Calif. 91302.

File servers

Communication Machinery Corp. has introduced the **Transerver**, a network terminal server featuring up to 10 ports.

The Transerver features telephone-style RJ-45 adapters for terminal connection. It offers an integral transceiver and can be configured as data terminal equipment/data communications equipment offering modem support for both dial-in and dial-out capability.

The terminal server is said to implement the Department of Defense Internet family of communication protocols.

Prices for the Transerver range from $1,695 for a four-port version to $2,495 for 10 ports.

Communication Machinery, 1421 State St., Santa Barbara, Calif. 93101.

Modems/Multiplexers

Okidata has introduced the **CLX96DP**, a 9.6K bit/sec. synchronous modem for use over dial-up or dedicated telephone lines.

The modem features automatic adaptive equalization providing compensation

Okidata's *CLX96DP*

for carried line conditions and complies with CCITT V.29 requirements. It operates in half-duplex mode on dial-up lines and half- or full-duplex mode on dedicated lines.

The CLX96DP costs $1,495.

Okidata, 532 Fellowship Road, Mount Laurel, N.J. 08054.

Luxcom, Inc. has announced its **Model 1105A** IBM Type A channel unit.

The unit is said to provide coaxial-to-optical-fiber multiplexing capabilities with the IBM 3174 controller. It provides direct coaxial connection to a standard 3174 controller configured with four ports.

At the device end, the product provides connections for up to four IBM 3299 coaxial multiplexers that support up to eight 3270 devices each.

The 1105A supports a fully loaded 3174 controller and lists at $795.

Luxcom, P.O. Box 57045, 3853 Breakwater Ave., Hayward, Calif. 94545

Retire Your PC Coax Connection

The PC-to-host coax connection. She was a good piece of equipment working with coax cable and cluster controllers, but time just passed her by. End users started needing more than simple host access. They also needed their PCs to share resources around the office. That's when local area networks came along to fill the need.

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INS Gateway PC Adapters are engineered around proven INS SNA 3274 cluster controller emulation. A single INS Gateway PC Adapter in an IBM NETBIOS compatible LAN, including Token Ring, will support up to 32 logical unit sessions. The LAN allows each PC on the network to share disks, printers and other resources while the Gateway allows performance of any host-supported function and maintains host access.

INS planned on PCs becoming a major component in the development of information systems. We designed our Gateways to be the logical choice in providing the vital link between LANs and mainframes. We also planned on much more—flexibility, simplicity and reliability. We provide free, responsive user assistance and guarantee every INS Gateway PC Adapter (hardware and software) for five years.

Now the vast resources of mainframes and local area networks are available at your fingertips with INS Gateway PC Adapters.

Call now for more information about putting new life in your MIS/DP efforts with INS Gateway PC Adapters. Our toll free number is **(800) SNA-3270,** in Alabama (205) 633-3270. Or write Integrated Network Systems, P.O. Box 91395, Mobile, AL 36691. Telex: 701238.

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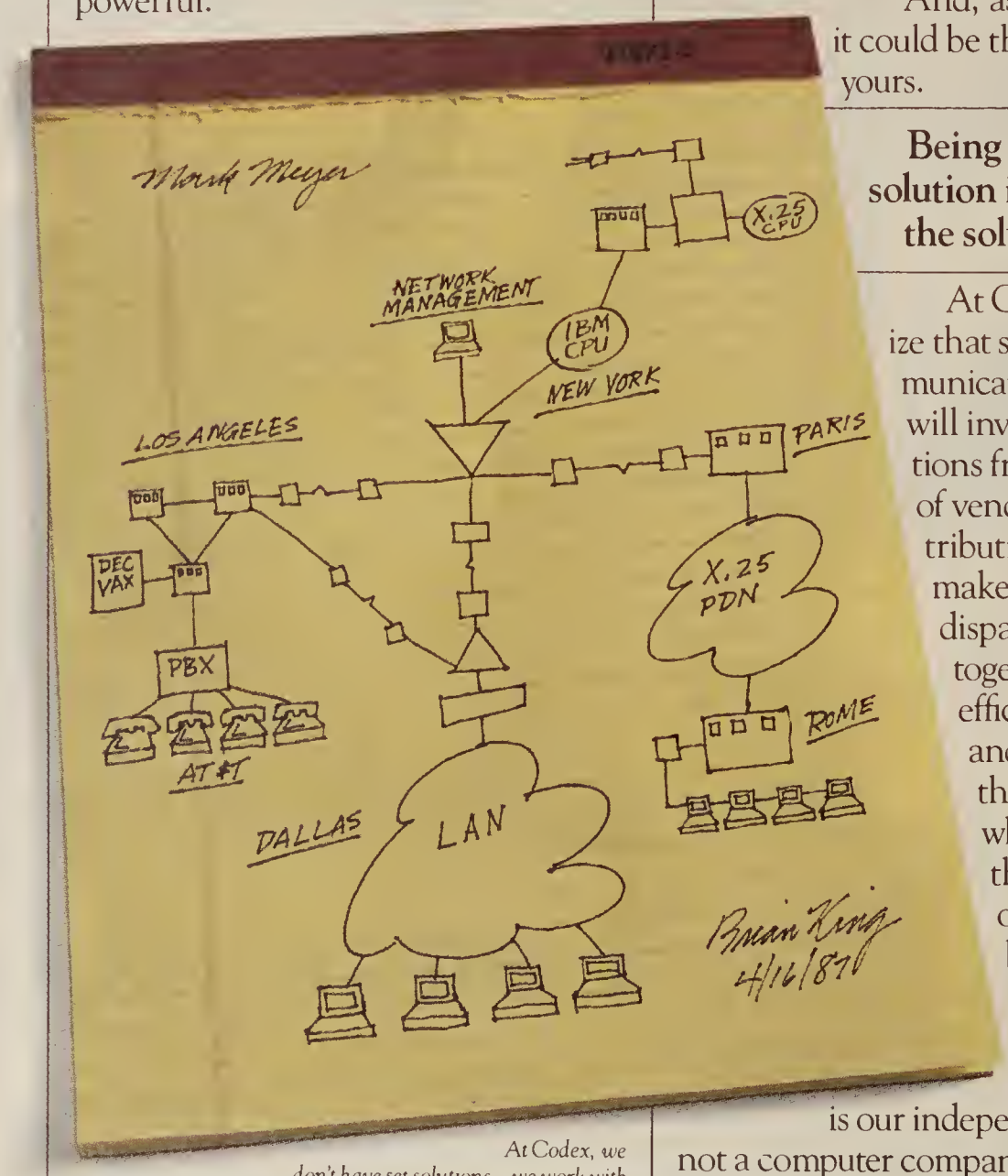

At Codex, we don't have set solutions – we work with your current environment. Which is why we spend a lot of time drawing diagrams like this.

Because we have merged their products with our specialized communications expertise to create the most powerful business tool of all:

A network.

Our ability to combine such various computer and transmission technologies into a single, productive, efficient communications tool has been the secret of our success.

And, as you'll see, it could be the secret to yours.

Being part of the solution is sometimes the solution itself.

At Codex, we realize that solving communications problems will involve contributions from a variety of vendors. The contribution *we* want to make is to tie those disparate elements together into an efficient network – and then give you the tools with which to manage that network on an ongoing basis.

Perhaps Codex' greatest advantage is our independence. We're not a computer company. We're not a phone company. We're a network company. So, in our 25 years of designing network solutions, we've worked with all sorts of equipment companies. And we've worked in countries all over the world. So we can maximize the performance and functionality of all the pieces of your network, regardless of which vendors they came from. Or where they are.

But simply designing solutions isn't all we do. We also support our solutions with a wide breadth of networking products. Our history of innovative product capabilities means you're getting reliable, high-quality communications products that will make your particular network as productive as possible. Because we address a variety of areas, we're never in a position of trying to force fit a particular technology into a solution. So we're able to analyze your needs objectively. The result? A productive, efficient network. Which, after all, is the only kind of network anyone wants.

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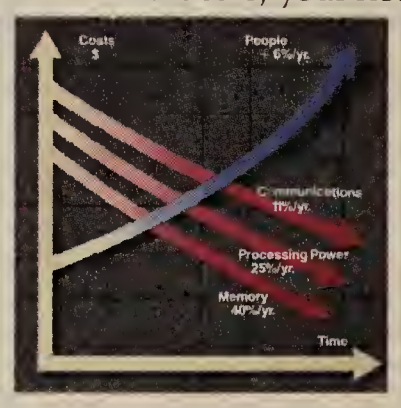

We can show you how a Codex networking design can be more profitable and more productive for your company.

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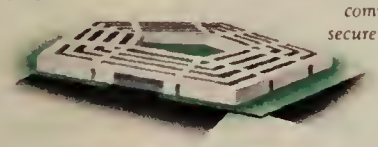
dent networking company. e've spent the past 25 years &T, IBM and DEC.

that investment is protected.

At Codex, this is one of our highest priorities.

1962



Codex develops its first data communications product for secure government applications.

1967

Codex announces the first commercial 9600 bps modem. In 1976, our technology is adopted as the international standard by the worldwide CCITT committee.

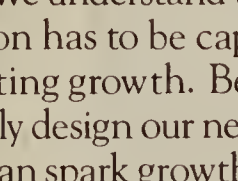
1975

Codex announces the first statistical time division multiplexer and pioneers the concept of network control.

1985

Codex introduces gateways that allow separate networks to be combined.

1985

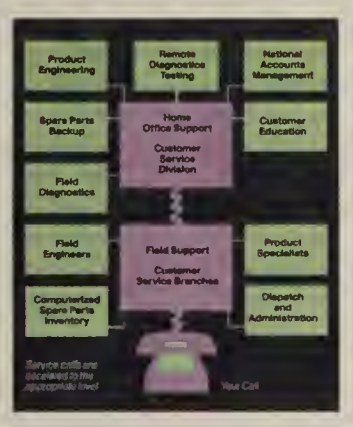


Codex introduces the first 19,200 bps modem with built in network control as a standard feature to optimize throughput and minimize downtime.

Codex hasn't just developed a lot of networking solutions. We've practically developed the whole business of networking.

We understand that a network solution has to be capable of accommodating growth. Better yet, we actually design our networks so that they can spark growth within your company – helping to drive it by being a vital and powerful corporate resource.

To do this, we have invested an enormous amount of time and money in R&D over the years. This commitment has made us keenly aware of the issues that face you and the kind of network problems that are likely to face you in the future.



When you call Customer Service, you've got the whole company on the line.

To help us further accommodate your company's future growth, Codex is very active in industry standards committees, helping to create the kind of "open architecture" that will allow you to link equipment from many vendors in a more productive way. With that kind of support, your network will be able to grow by leaps and bounds. And your business along with it.

For years, we've worked with some of the best-known companies in business. Isn't it time we worked with you?

Codex is currently working with 97% of the Fortune 100. These companies, like yours, have to rely on their network for success. And, since they're considered to be among the most successful companies in the world, it would appear that our network solutions are working. And that the experience we've gained from those associations and others can be put to work just as successfully for your company.

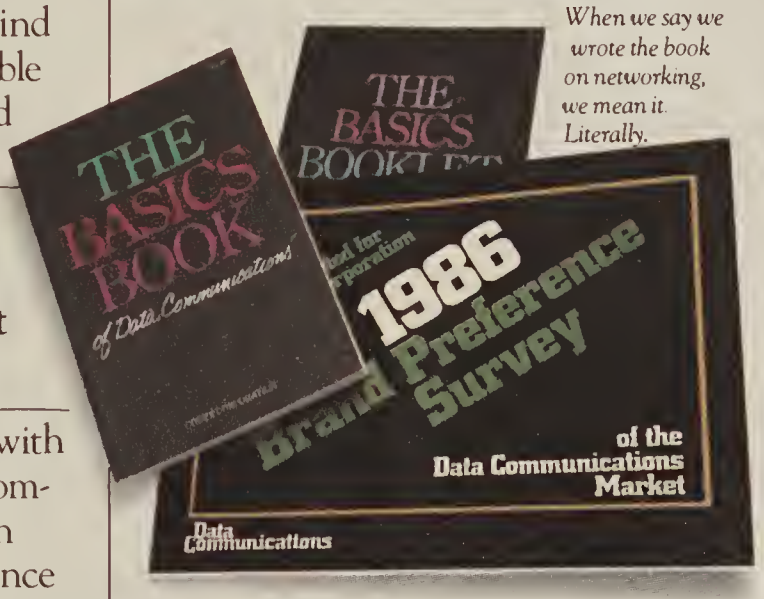
In fact, in a recent *Data Communications* survey, many of these and other companies consistently ranked Codex first as the networking vendor they preferred in categories ranging from best price/performance to technology to customer support.

And of course, beside working for successful companies, we're also backed by a successful company – Motorola.

How can you find out what Codex can do for *your* applications?

You can start by calling Codex at **1-800-426-1212, Ext 247**. Or write to Codex Corporation, Dept. 707-47, Maresfield Farm, 7 Blue Hill River Road, Canton, MA 02021-1097.

We'll be happy to send you a free copy of *The Basics Book of Data Communications* – an informative guide to the ins and outs of networking based on our extensive experience.



When we say we wrote the book on networking, we mean it. Literally.

Of course, the book should be informative. After all, it took 25 years to write.

codex

MOTOROLA

The Networking Experts

See Codex at booth #1621 at the ICA show, May 18-21.

Focum Systems has introduced the **Focum 1600 Series 8 Channel Multiplexer.**

The Focum 1600 is said to be compatible with the IBM 3270. It can be used in point-to-point, star or multidrop configurations. The remote unit utilizes two-way fiber-optic cable, and terminals can be located up to one mile from the controller.

Operation is said to be transparent to the input data at 2.4M bit/sec. Transmit, receive and power status indicators are standard.

The Focum 1600 costs $1,495.

Focum Systems, 160 Speen St., Framingham, Mass. 01701.

Racal-Vadic, Inc. has announced **2400PA Model 2**, an enhanced version of its 2400 PA 2,400 bit/sec. full-duplex modem.

The modem is said to feature front-panel control, an eight-character LCD, a built-in speaker, multiprotocol automatic dialer and compatibility with the vendor's ATPlus command set.

The device operates at 2,400, 1,200 or 300 bit/sec. synchronously or asynchronously.

The 2400PA Model 2 is priced at $795.

Racal-Vadic, 1525 McCarthy Blvd., Milpitas, Calif. 95035.

Eicon Technology Corp. has introduced the **Dial Network Adapter**, an intelligent modem.

The Dial Network Adapter is V.22 bus-compatible and permits synchronous, full-duplex 2,400 bit/sec. access to CCITT X.25 packet-switched data networks.

Users can establish up to 32 concurrent X.25 sessions.

Features include the ability to program telephone numbers, automatic dialing and automatic storing.

The Dial Network Adapter is included with Eicon's communications gateway products. Prices start at $1,295.

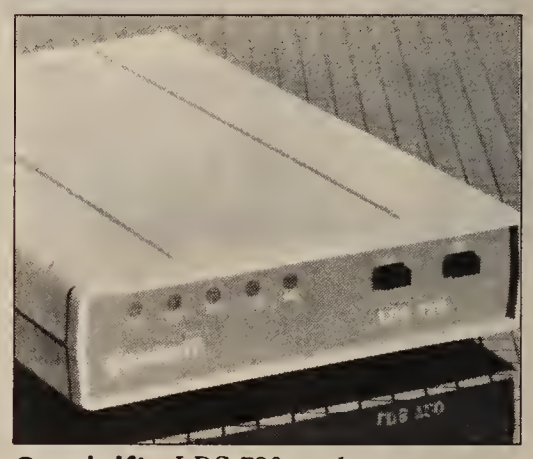
Eicon Technology, 3452 Ashby St., Montreal, Canada H4R 2C1.

Gandalf Data, Inc. has announced the **LDS 720**, a two-wire short-haul modem.

The modem is said to provide synchronous or asynchronous data transport at speeds of up to 19.2K bit/sec. It is auto-equalized and can transmit and receive data between users and computing resources up to 7.9 miles apart, the vendor said.

The LDS 720 is available as a stand-alone for $595. As a rack-mount card for computer room use, it is priced at $570, the vendor said. Up to 14 cards fit in a standard 19-in. rack.

Gandalf Data, 1020 S. Noel, Wheeling, Ill. 60090.



Gandalf's *LDS 720 modem*

Cabling

Electro Standards Laboratory, Inc. has introduced the **Series 7000** line of rack-mount A and B switch modules.

The Model 7001 provides A and B switching of the RS-232 data interface. The Model 7010 power and control module provides power for up to 12 Model 7001 electronic switch modules.

The Model 7001 front-panel momentary toggle switch transfers the common device signals to the port A or B device. The Model 7010 power and control module features simultaneous switching of all Model 7001 switch modules it supports.

The Model 7001 costs $225, and the Model 7010 costs $295.

Electro Standards Laboratory, P.O. Box 9144, Providence, R.I. 02940.

Patton Electronics Co. has announced the **Model 400 coaxial**, **Model 410 twinaxial** and **Model 420 dual-coaxial devices.**

The devices are said to allow IBM 3270, IBM System/34, 36 and 38 and Wang Laboratories, Inc. dual-coaxial systems to use standard telephone wiring between computers and terminals.

The units are said to be able to use either standard RJ-11 modular telephone plugs or a screw-type terminal block to connect telephone wire to the baluns.

Prices start at $29.50.

Patton Electronics, 11129 Arroyo Drive, Rockville, Md. 20852.

American Lightwave Systems, Inc. has announced the **FT1300**, a 16-channel fiber-optic system.

Each channel of the FT1300 is said to be capable of carrying either one uncompressed video channel, a DS3 trunking channel, seven DS1 channels or a combination of FDM channels compatible with broadband local-area networks. Any mix of video, DS3/DS1 and FDM data channels is possible concurrently, the vendor said. Transmission is possible up to 20km.

The FT1300 carries 16 uncompressed video channels at a cost of $6,000 per channel, plus fiber.

American Lightwave Systems, P.O. Box 1549, 358 Hall Ave., Wallingford, Conn. 06492.

COMPUTERWORLD

SPOTLIGHT

T1 TECHNOLOGY

T1 transmission facilities open up new vistas of capacity and efficiency, but this route is not yet heavily traveled, and there are some tricky spots along the way, especially where private networks intersect with public services.

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Computerworld SPOTLIGHT'S DIAL-INQ Telephone Inquiry Service Speeds Your Request For More Information To The Vendors You Select

With each SPOTLIGHT issue, you have access to *Computerworld's* exclusive DIAL-INQ service. It gives you the opportunity to immediately request information about all products and services featured in the SPOTLIGHT section. And to take advantage of DIAL-INQ, all you need is a touch-tone telephone. Just input your individual DIAL-INQ subscriber code and the DIAL-INQ reader service numbers assigned to advertisements and product listings appearing in SPOTLIGHT, and you'll be well on your way to receiving all the information you need. *Computerworld* DIAL-INQ is at your service 24 hours a day, 7 days a week. What's more, you can request information on products and services up to three months after each SPOTLIGHT is published.

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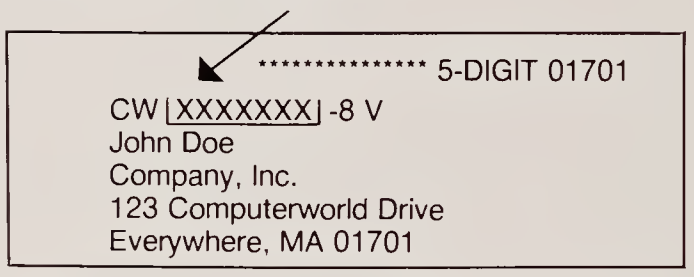

If the label does not bear your name, call 1-413-637-0605 (9:00 A.M. to 9:00 P.M. EST, Monday through Friday) and ask for *Computerworld's* DIAL-INQ service. An operator will assign you your own personal 9-digit DIAL-INQ subscriber code which will become active immediately.

2. Identify those products/services for which you're requesting more information. Write their respective DIAL-INQ reader service numbers in the boxes provided in step 6.

3. Call *Computerworld* DIAL-INQ inquiry service at **413-637-3170 anytime, 7 days a week, 24 hours a day,** via touch-tone telephone and wait for the recorded instructions.

Please note: You will be asked to use the "star" (*) and the "pound" (#) symbols on your touch-tone telephone set during your telephone call.

4. When prompted by the recording, enter your DIAL-INQ subscriber code and symbols as recorded below.

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5. When the recording says, "Enter magazine code and issue code," enter these numbers and symbols:

1 4 5 # 7 1 7 # #

6. You will be prompted to enter the DIAL-INQ reader service number, including the the symbols, for the first product/service you've identified below. You will be prompted to repeat this step as needed to input additional DIAL-INQ numbers.

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7. Complete your phone call by entering the following symbols:

# #

You've now successfully completed your inquiry call to Computerworld DIAL-INQ. Remember . . . you can make as many phone calls as you wish — and request information about products/services in any SPOTLIGHT section up to three months after this issue's published date.

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You don't need deep pockets to be a candidate for the extra quality and flexibility of T1 transmission facilities.

BUYING ROOM FOR GROWTH

BY ROBERT DAYTON

BLAIR THORNLEY

T1 is not a technology that works only for the Fortune 500. Economy is usually the reason organizations are drawn toward consideration of T1, and the cost-saving benefits of this class of communications services are as available to the mid-size commercial consumer as to the large.

Clackamas County, Ore., for example, saved almost $40,000 by opting to use T1. Faced with annual increases in the cost of leasing analog tie trunks, the county signed a five-year lease contract in July 1986 for a Siemens Saturn III digital private branch exchange (PBX) interfaced to three T1 lines.

Siemens Information Systems, Inc., maker of Clackamas County's PBX, itself found savings in using T1 as well, even spanning short distances. Seimens shifted to T1 lines for 55 of the 89 links connecting the seven buildings located at its 56-acre headquarters in Boca Raton, Fla. T1 implementation costs will be paid back in 18 months, after which the firm says it will realize a savings of $28,000 per year.

Although "T1" once referred to a type of carrier equipment, it is now the designation for all 1.544M bit/sec. digital services, whether the line is wire, microwave or fiber. T1 is economical for a number of reasons, including the savings derived from bundled transmission and the bypassing of local telephone company access charges. The basic T1 multiplexer provides at least 24 channels, and additional circuits are available for the price of a couple of channel cards.

This leads to another benefit, the leeway to add circuits as they are needed instead of waiting for the telephone company to grind through its paperwork. Seasonal growth is a breeze when there are no installation charges every time a circuit is added.

At New York's Pace University, T1 flexibility is considered a more significant advantage than the $112,000 a year Robert Yannocone, director of data communications, says the institution saves on data circuits alone. Pace is currently using only about half the bandwidth available on the T1 network that connects its four city campuses, according to Yannocone, and that leaves plenty of room for implementation of ideas like full-motion video teleconferencing among campus locations.

There are also qualitative reasons for considering T1. Besides lower prices and bulk-quantity bandwidth, T1 offers crisper and cleaner communication. Transmission quality of a 64K bit/sec. Pulse Code Modulation (PCM) circuit is unsurpassed by any other method. The transmission level is flat between 300Hz and 3,400Hz. This means trellis-code modems run at their top data speed. It also means talking over a circuit on which one cannot perceive noise.

On analog lines, it is frequently possible to gauge the distance of a call by the level of interference. Fiber-optic circuits also have some thermal noise, but the level is so low that it is virtually undetectable. Use 64K bit/sec. PCM with fiber-optic facilities, and you can practice dropping pins like the actors in the U.S. Sprint ads.

In the past couple of years, public telephone networks have also begun offering a number of services that make T1 use even more attractive. In 1985, AT&T introduced two services called Megacom and Megacom 800, which use a T1 line

Dayton is founder of Dayton Associates Communications Consultants, Inc., a telecommunications consultancy based in Flemington, N.J. He specializes in digital communications and customer-premise equipment.

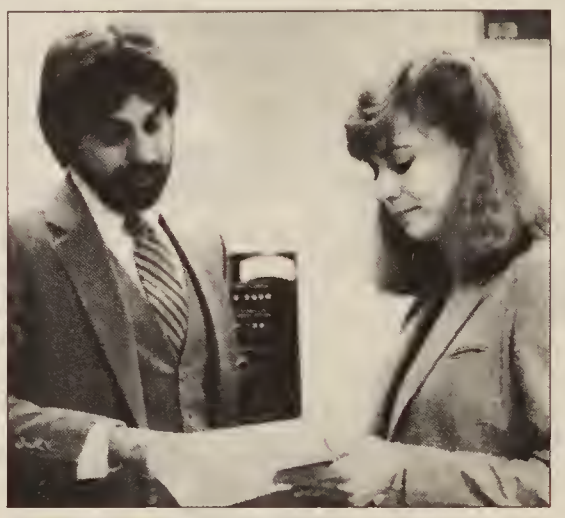
Buying room

FROM PREVIOUS PAGE

to get to the long-distance network. The T1 line basically eliminated the local telephone company switch that handled the WATS and toll-free service lines. Some of the handling functions of that end-office switch then had to be included in the premise multiplexer or the PBX.

AT&T originally offered a Digital Channel Bank (D-Bank) multiplexer in central offices as a means of fanning out voice circuits from a customer's T1 line. Customers, however, wanted data circuit fan-out too. And eventually, it did become possible for T1 services to have data circuits connected into Digital Data Service (DDS) at a limited number of offices.

Manufacturers are redesigning equipment to interface with the integration of telephone company services. Integrating services on the same T1 line provides even greater economy. Instead of individual lines for each service, the services are bundled together on one T1.



Robert Yannocone, *Pace University*

Bundling and routing

At the telephone company's office, the T1 line interfaces with AT&T's Digital Access Cross-Connect System (DACS). The DACS unbundles the services first. Then it rebundles similar services on T1 lines to other equipment or offices. Voice services such as WATS and 800-services route to switching machines. DDSs route to another DACS or digital data switch dedicated to data.

Now, not only AT&T but other long-distance carriers offer a service that gives T1 customers access to electronic cross-connection equipment. AT&T offers a service called Customer-Controlled Reconfiguration, and Bell Atlantic Corp. offers Flexcom. Both services provide control of dedicated DACS. The divested Bell operating companies refer to them as Digital Cross-Connect Systems.

What constitutes DACS compatibility? It is the multiplexer's or PBX's ability to communicate with a DACS at a 64K bit/sec. DS0 level. Central-office DACS allow the customer to switch 64K bit/sec. time slots from one T1 to other T1s. While DACS are designed to switch at the 64K bit/sec. level, customers can also switch the entire T1 service or groups (bundles) of time slots. The advantage of this is particularly evident for disaster restoration.

Often the best of two worlds occurs when private networks combine with public network services. Private networks offer the user total control; however, he is also responsible for troubleshooting, training and providing spare equipment. With a public network, the user abandons control of the network to the phone company.

Integrating a private network with a public one allows the user to maintain a portion of control of the network while obtaining the benefits of a single clock source from the telephone company.

The equipment list

After some preliminary economic studies have been made, it is time to detail all the equipment that will be needed. Simple things like connecting cables cannot be overlooked. A number of manufacturers make special cords for data lead turnovers as the only method of interfacing with their unit. It is critical to pay attention to such interfaces.

When ordering equipment for an installation, be sure to include channel service units (CSU) for each termination of the T1 line. Local telephone companies are installing fiber-optic cable in most locations. Request information from them as to the type of interface they are going to provide and the need for a CSU. CSU prices range between $1,000 and $2,000.

> INTEGRATING a private network with a public one allows the user to maintain a portion of control of the network while obtaining the benefits of a single clock source from the telephone company.

Until recently, the telephone companies were required to provide line power to the CSUs from their central offices. The divested bell operating companies object to this practice for a number of reasons, the primary one being that they receive no payment for supplying this power. As local companies move toward extensive fiber-optic installations, a self-powering CSU requirement seems imminent.

Another important feature to consider is the CSU's ability to provide the Extended Superframe Format (ESF) to the line. While the price of the additional circuitry required may range from between $500 and $1,000, the benefits of being able to quickly localize troubles will soon override the expense. CSUs with ESF take a data stream with a D4-frame format and replace the frame sequence with an ESF. A number of registers store data in 15-min. segments over a 24-hour period.

Installation of ESF started in 1986 but may take another couple of years to be completely deployed by all of the public networks. MCI Communications Corp. says its Digital Data Network will employ ESF technology by the middle of this year.

Contrary to some vendors' claims, there is not any Data Service Unit (DSU) for T1. DDS/DSU functions, like clock recovery, are a part of the multiplexer. Since the clock recovery is a function of the terminal, the CSU and the T1 line are considered isochronous devices.

Isochronous transmission is serial-binary data in which the data terminal equipment derives the clock from incoming data. Synchronous transmission is serial-binary data in which the data communications equipment provides the terminal clock.

If ESF is used, there is probably no need to purchase test equipment to test the T1 line. Available data test equipment would still be used for the data circuits. An increasing number of test sets are available for T1. Almost all are for the D-Bank-technology multiplexers and would not be of any use with bit-interleaved multiplexers.

Host-to-host transmission at 1.544M bit/sec. may need a mass storage data scope similar to Telenex Corp.'s T-Scope. Tekelec offers the Chameleon 32 Protocol Simulator/Analyzer that supports the Integrated Services Digital Network Primary Rate-based networks.

Skill levels

Multiplexers, a major cog in any communications network gear, are not easily bought. To begin with, there are more than 50 vendors in the market, sometimes with multiple offerings. However, some multiplexers are now being invested with powers that go well beyond the traditional definition. In fact, it is possible to divide the entire multiplexer market into three broad groups — low-end, mid-range and high-end.

The low-end includes the 24-channel digital channel banks. These banks adhere to all the specifications of the 1982 Bell

Continued on next page

Beware of jitters and error bursts

There are several constraints associated with T1 multiplexers and transmission about which data communications professionals should be forewarned.

One well-documented, although little understood, quirk of the technology is something called "jitter." Jitter is the difference between ideal and actual arrival times for digital pulses. It is something on the network and is cumulative from end to end.

A major cause of jitter is the 45M-byte multiplexer that adds bits to compensate for differences in the timing on T1 lines. Another group of offenders is the repeaters or regenerators on the access line to the customer. Each repeater recovers its internal clock from the incoming data. The circuitry to recover the clock has an inherent jitter characteristic. Since jitter is cumulative, every additional repeater means a higher magnitude of jitter. Multiplexers that cannot meet the tolerance level will fall out of synchronization.

Unlike analog transmission, in which errors hit randomly and are distributed over time, digital transmission suffers from error bursts. Digital transmission will not incur an error for hours, days or weeks and then will gush out a stream of them. Bursts can be caused by microwave systems switching to a protection service or from human error. Duration can range from a few milliseconds to several seconds. Multiplexers going into retrain may produce strange sounds on voice circuits. Product selection should, therefore, include listening to the voice circuits under both normal and failure/retrain conditions.

Another constraint is Superframe integrity. A telephone network requirement is that multiplexers use a D4 or Extended Superframe (ESF) format. This means that every 193rd bit will have a framing pattern bit inserted. Some manufacturers of customer-premise equipment place their own framing information in relation to the T1 framing pattern. The Superframe pattern, D4 or ESF, sent by one unit must be in the same order at the other end.

If the service is point-to-point, maintaining end-to-end Superframe integrity is not a problem. When the same service connects to AT&T's Digital Access Cross-Connect Systems (DACS) link for disaster restoration, the customer-premise equipment will fall out of synchronization. A DACS inserts a new Superframe pattern that will almost certainly shift the customer-premise equipment's own framing pattern out of the expected location.

Customer-premise equipment vendors advertise that their units are compatible with DACS and AT&T's Customer Controlled Reconfiguration. They may mean their unit can pass through a DACS at the 1.544M bit/sec. level only. To be truly DACS compatible, the multiplexer must be formatted in 8-bit bytes that form a basic building block of 64K bit/sec. DACS design switches at the 64K bit/sec. level. When a DACS switches at the full 1.544M bit/sec., it does it by switching 24 64K bit/sec. time slots.

Analog data using a switched-voice channel may use robbed-bit signaling. Robbed-bit signaling for supervision takes the least significant bit out of every sixth 8-bit byte for the particular channel. The customer-premise equipment multiplexer inserts a signaling bit in the proper locations in the Superframe. DACS equipment then pulls off the signaling information. It waits to insert it in the proper spot in the outgoing frame. This process degrades the overall quality a fractional amount. Robbed-bit with multiple DACS in tandem may degrade quality discernibly.

> DIGITAL transmission will not incur an error for hours, days or weeks and then will gush out a stream of them.

Still another network constraint is the requirement for ones-density. However, although ones-density is still necessary to preserve the health of older repeaters on the T1 access lines, today's repeaters can tolerate longer periods of inactivity and still maintain their clock-recovery circuit.

AT&T launched a program in 1986 to change its network from a 64K-byte ones-density system to a 1.544M-byte system. At the DS1 level, ones-density uses bipolar eight-zero suppression, better known as B8ZS. Verilink Corp. introduced a device that uses a zero-byte time-slot interchange method that removes a string of eight-zeros and inserts a coded word to tell the other end where to put the removed zeros. Both methods will probably fade as more local telephone networks convert to fiber-optic cable. •

ROBERT DAYTON

Buying room

FROM PREVIOUS PAGE

System Technical Reference PUB 43801. Since their design is simple, the 24-channel banks' cost is the lowest, and their mean time between failure is the highest. Prices range from $7,000 to $10,000.

Mid-range multiplexers provide some limited networking capability. Drop-and-insert features allow some efficiencies in a three-point network. This feature is similar to the central-office DACS. It can switch a channel from one T1 line to another T1 line.

Some vendors call this capability "drop and insert," and others call it "bypass." Its main advantage is that it quickly adds flexibility at the customer's premises by allowing some circuits to pass through an intermediate unit.

Nevertheless, an outage at the intermediate location will also take down the circuits that were passing through at the time. Other disadvantages are possible clocking problems and the necessity to acquire additional access lines. Prices for the mid-range multiplexers range from $10,000 to $75,000.

The high end of the multiplexer market represents the fastest growing segment. Because their prices can run as high as $250,000 a unit, these are becoming the flagship product of vendors. It makes sense to spend the time selling one of these high-end devices instead of selling 25 low-end products.

High-end units provide network management software. They can reconfigure the entire network when a T1 line is open. High-end units also provide a very high level of network control, which is appealing to some companies.

There are, however, disadvantages attached to these products, beyond their weighty price tags. A control channel for the commands and diagnostics will use up to 16K bit/sec. of bandwidth. Rerouting data circuits can result in excessively long distances that will change your response time. Before rerouting any circuits, it is best to determine how long the facilities will be out. Priority of the circuits and the available bandwidth on the other T1 lines will determine when to start reconfiguration.

Dissecting a multiplexer

T1 multiplexers use two framing formats. The basic frame format the telephone companies have been using since 1962 is D-Bank, 24 8-bit bytes interleaved together. All digital equipment in the telephone office uses the basic building block of 8-bit bytes, sent 8,000 times per second. Building blocks of 64K bit/sec. (8-bit bytes multiplied by 8,000 times per second) are also the foundation of the Consultative Committee on International Telephony and Telegraphy standard. Digital PBXs with T1 interfaces use this method to communicate with telephone switches.

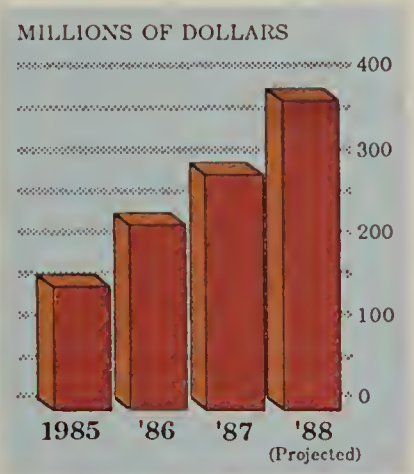
During the latter part of the 1960s, data communications manufacturers introduced bit-interleaving for synchronous multiplexers. Bit-interleaving reduced the delay through the equipment and, to a degree, improved its efficiency. Asynchronous multiplexers use a character- or byte-interleaving structure.

While bit-interleaved multiplexers are more efficient than byte-interleaved, they can communicate only with another unit of the same product. Each bit-interleaved multiplexer has its own proprietary frame format. Once you have chosen a particular vendor, you are locked into its technology. (It can be similar to selecting a personal computer and finding out it does not work with anything else.)

Several locations are trying a new technology, called wideband, or fast packet. Stratacom, Inc. announced Integrated Packet Exchange, a T1 packet multiplexer. An assumption made by fast-packet users is that analog data modems account for a very small part of communications, an assumption that has been proven wrong. While the concept of fast packet is worthy, it may not be fully accepted because of analog data modems.

T1 market growth

Total equipment sales 1985 to 1988



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CW CHART: SUSAN ALDAM

Users often lose sight of the fact that they should consider both frame structure and framing pattern. While frame structure refers to whether a multiplexer is byte-interleaved, bit-interleaved or packet, framing pattern refers to the particular bit configuration inserted in every 193rd-bit position, as required by the telephone tariff.

Public networks usually require a framing pattern to be either a D4 — the digital channel bank framing pattern — or ESF. However, private networks on microwave systems do not need any framing pattern.

Subrate data multiplexers are just now coming on the market. This technology provides users with an economical way to add 2,400, 4.8K and 9.6K bit/sec. synchronous data to D-Bank technology. AT&T Technology Systems provides a digital data bank unit that can plug into a standard D4-Bank.

This plug-in uses the standard framing pattern used with DDS Subrate digital multiplexers. It is a new alternative to providing DDS without backhauling to one of the DDS hubs.

While subrate multiplexers are still not as efficient as bit-interleaved units, they lead to a stable design that is based on a standard. Private networks do not have to worry about standards. As soon as you connect into the telephone networks, however, standards are the only way of life. Although restrictive and inefficient, standards provide a means of hopping among networks and services.

Also, a number of vendors now make compatible equipment, providing several sources from which to choose. In addition, standard technology has proved itself over the years, having had most of the bugs removed.

Proprietary technology can sometimes lead to unforeseen problems. One large communications company that selected a one-of-a-kind multiplexer spent one year applying Band-Aids to all the trouble spots before the network was operable.

Buying proprietary technology can be like buying a foreign car with a name nobody can pronounce and having it sputter at 3 a.m., miles away from the nearest dealer. No doubt your next piece of equipment will have interchangeable parts that are stocked everywhere.

> HIGH-END units provide network management software. They can reconfigure the entire network when a T1 line is open. High-end units also provide a very high level of network control, which is appealing to some companies.

Before plunging into a T1 installation, several points deserve consideraton. One includes all the transmission constraints that the marketing representatives may forget to mention.

Multiplexers that use analog-to-digital coding schemes, other than PCM, may present analog data transmission problems. There is one design that limits the upper frequencies of the voice-grade channels to something that approaches 2.8 KHz.

Limited frequency performs a little magic in the coding method. While most users may not notice any difference in a voice connection, data sets with secondary channels around 3 KHz would suffer.

Analog-to-digital coding methods provide the user with varying levels of analog data performance. Again, 64K bit/sec. PCM is the industry standard. You can use multiple or tandem conversions of analog to digital to analog and still have data run at 9.6K bit/sec.

Continuous Variable Slope Delta (CVSD) modulation appears in many multiplexers. Its inherent noise level will permit only 4.8K bit/sec. analog data on one conversion, and multiple conversions will not carry that rate. Claims that some compression methods can transmit 9.6K bit/sec. are not realistic. It is one thing to run data on the test bench and another in the real world.

CVSD deteriorates on a linear scale from acceptable — approximately 40K bit/sec. — to barely acceptable at 16K bit/sec. At 32K bit/sec., there is a discernable quantizing noise, which makes it subjectively lower in quality to the new ADPCM signal.

Adaptive Differential PCM (ADPCM) has finally become a worldwide standard. The Exchange Carriers Association and CCITT adopted a revised standard in September 1986.

Before this, ADPCM methods would not allow the use of Bell 202-type modems in a conversational mode. A number of ADPCM methods sold are not compatible with the standard,

Phrase guide to the language of T1

Alternate mark inversion (AMI) — The signal used on T1 lines that transmits consecutive one-bits by inverting the polarity of each bit. Zeros are represented by time, not by voltage.

Bipolar eight-zero suppression — Removes the requirement for ones-density at the 64K-bit level by sending a bipolar violation code at the 1.544M-bit level.

This method requires alterations of equipment at the telephone office that would otherwise indicate an error.

Bipolar violations — An AMI coding method violation that occurs when consecutive "ones" do not invert polarity but are of the same polarity.

At one time, bipolar violations were the only way that telephone companies could tell if there was a bit slip or hit on their lines. This method is currently being phased out by Extended Superframe.

Bundles — A term used to describe a group of 64K-bit time slots in the T1 facility.

When used with Adaptive Differential Pulse Code Modulation transcoders, it refers to six 64K bit/sec. time slots or 384K bit/sec.

Clear channel capability — A term used to mean that the 64K-bit time slot does not need ones-density considerations.

Some manufacturers place a one-bit at every eighth-bit location to meet the ones-density requirement. This means there is another 192K-bits of overhead that are used just for ones-density.

D4 frame format — Refers to a particular pattern (100011011100) that appears one bit at a time in the 193rd bit position of the Superframe.

Each D4 Superframe has 12 main frames at 192 bits in length. This pattern accounts for 8K-bits out of the 1.544M-bits leaving only 1.536M-bits for information.

Echo cancelers — Cancels a discernible echo that occurs when networks exceed 1,850 actual miles and there is a four-wire to two-wire conversion.

Echo cancelers digitally remove an echo to a point where it cannot be perceived.

Error-free seconds — Error performance of the T1 service expressed in terms of the percentage of seconds in a day in which there are no errors.

Conversely, errored seconds are the number of seconds that do have errors.

Ones-density — A long-standing requirement to provide enough AMI signals with enough "ones" to maintain the clock recovery of repeaters.

Primary channel — A name for the T1 line that is formatted in the Integrated Services Digital Network method of 23-B — or information 64K-bit —time slots plus one D — or signaling and data — channel.

ROBERT DAYTON

nor are they of the same quality.

When selecting a product with ADPCM, make sure the design meets the 1986 standard. Subjective tests show there is no perceived difference between voice at 64K bit/sec. PCM and the standard 32K bit/sec. ADPCM signal. ADPCM deteriorates dramatically at less than 32K bit/sec. Analog data signals up to 4.8K bit/sec. can undergo three or four transcodings. Modems that use the new trellis-coding methods for forward error correcting would be able to support 9.6K bit/sec. Modems that utilize the CCITT V.29 modulation will not provide satisfactory performance, even over one section, according to AT&T Bell Laboratories.

Other 32K bit/sec. coding methods use various coding methods. Nearly Instantaneous Companding and Variable Quantizing Level have less quantizing noise than the CVSD signal. They are also considered subjectively lower in quality to the standard ADPCM signal.

NEW CODING methods appear in technical papers almost daily. Most of them would present problems to analog data modems.

Two emerging coding methods are Variable Companding PCM and Digital Multiplexer Increased Capability. New coding methods appear in technical papers almost daily. Most of them would present problems to analog data modems.

Some multiplexer manufacturers use Digital Speech Interpolation (DSI) along with 32K bit/sec. codes to increase the number of voice channels. DSI has an inherent clipping characteristic and may interfere with analog data modem performance.

The point to keep in mind is that 32K bit/sec. and slower voice channels present problems to analog data at the same time that analog data modems are becoming faster and cheaper. They will always be around, operating at higher and higher speeds.

It is also important to question vendors closely when they claim DACS compatibility. Unframed customer-premise terminals will not work with a DACS.

Customer-premise devices should also format into 8-bit bytes to switch at a DS0 level. Multiplexers that have formats other than 8-bit bytes cannot have channels switched at a DS0 level. Bit-interleaved multiplexers cannot interface with a DACS at the 64K bit/sec. level. If the multiplexer is software driven, users may be able to form some channels into an 8-bit byte format.

Some multiplexers group channels into bundles that are equal to bewteen five and eight time slots. As long as the information is in multiples of 64K bit/sec. time slots, the DACS will transfer the data without error.

If you plan to include telephone company DACS equipment, there are still other issues to consider. For example, terminal equipment should respond to the various alarms from the network equipment, as specified in Bell System Technical Reference PUB 43801. These alarms notify the user of a trouble condition and control the signaling supervision of the individual circuits.

Something else to remember is that T1 lines often are twice as long as the airline mileage between points. The longer distance and the necessary additional equipment will cause the response time to suffer. Getting into the larger nodal networks will add to your frustration. If the circuits on one of the T1 lines reroute to another line, chances are your response time will surpass the limits.

A rule of thumb in figuring delay along the facilities is a factor of 1 msec per 100 miles. To be on the safe side, consider the actual distance to be 2½ times the airline distance.

Some planners get carried away when they begin designing networks. They try to place the multiplexers behind each other to really pack the T1 line and show greater economy. This leads to what can be called

the "ripple effect."

An airline company placed 56K bit/sec. multiplexers behind a T1 multiplexer and fed the T1 multiplexer into an ADPCM transcoder. A two-second error burst on the T1 line resulted in 10-second outages for the computer port and the distant terminal.

First, the T1 line would go into an alarm condition. Next, the ADPCM, then the T1 multiplexer picked up the alerts and finally the 56K bit/sec. multiplexers, just as if someone had thrown a stone into a calm lake and watched the ripples go out.

After the T1 line retrains and is back in synchronization, the ADPCM units would retrain. Finally, all the units would be in synchronization, and the computer and terminal would get a Clear To Send indication — another time-consuming ripple effect.

An even more serious mistake for a company venturing into T1 is the failure to consider both voice and data personnel.

In the past, telecommunications groups controlled the voice circuits, and MIS managed the data circuits. With the advent of T1, however, integration of voice and data services and management makes economic sense. The only catch lies in making sure the interests of both are adequately represented.

In one sense, input from the voice side is more critical because digital data connections to multiplexers are a known entity and can be planned for, while the amount of analog data modem use on voice circuits is guesswork at best. But, for really satisfactory results, a balance of representation is imperative.

Why this is so important is illustrated by the problems experienced by another large communications company that integrated two distinct networks on one T1 network. One network was completely analog voice; the other digital data. Suddenly, analog voice-testing personnel with no digital service-testing experience were responsible for testing digital services for the data group, which was 2,500 miles away.

A modest downside

The greatest deterrent to using T1 is that you are putting all your eggs in one basket. If the T1 line or the premise equipment is in trouble, then a lot of service goes with it.

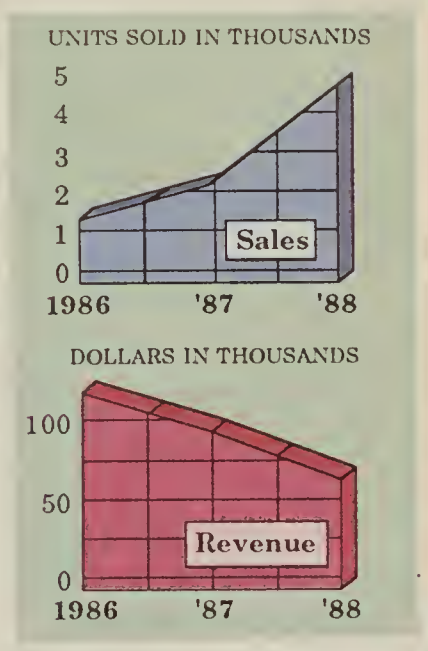
Duplicate facilities or access lines improve the uptime for companies with critical data needs. Get an early agreement with the T1 carrier that its technicians will treat the T1 line on a priority basis. Typical telephone company trouble-clearance practice is based strictly on First-In, First-Out priority. Reports of minor service outages take precedence if they arrive in the queue before your crisis.

Planning for a T1 network now is worth the time spent. Even if there is only a small economic advantage, the chance of lower cost facilities is great. Digital services of 6M and 45M bit/sec. are being introduced by a number of companies. Pricing for a 45M bit/sec. service is cost effective, and its crossover point is just seven T1 lines, leaving 21 T1 lines free.

Possession of this kind of added capacity at no additional facility cost presents all kinds of intriguing possibilities — from video to host-to-host — for voice and data communications managers to contemplate. •

T1 multiplexer market

Sales and pricing trends



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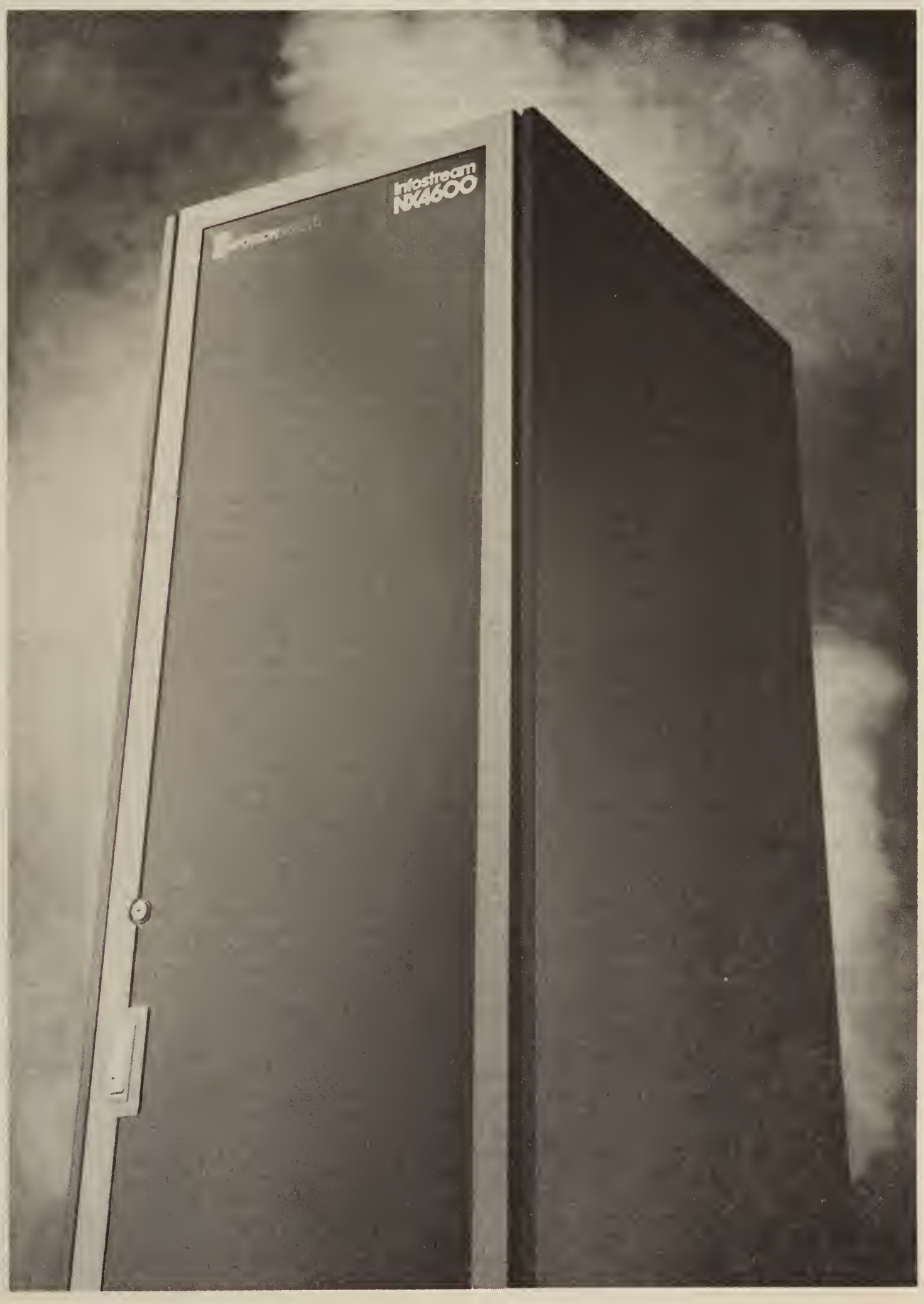

INFOTRON

You're In Control.

Learning to keep time on a network

BY MICHAEL FINNERAN

In the design of any digital network, one of the most important considerations is that of network timing. The interconnection of any two digital network components requires some timing reference to ensure that bits move accurately across the interface.

A number of techniques are used to see that devices maintain synchronization, that is, operate at the same bit rate. In a synchronous data communications interface using RS-232, for example, synchronization between a terminal (data terminal equipment, or DTE) and a modem (data communications equipment, or DCE) is maintained by using a strobing signal carried as a separate electric circuit.

Either device is capable of providing the timing reference, and the transmitted bits pass across the interface in conjunction with that timing reference — one bit for each pulse on the strobing signal.

The use of a separate electrical circuit to provide a timing reference is impractical in longer distance digital transmission systems, so a different mechanism is used. In DS1-rate (1.544M bit/sec.) transmission interfaces, the timing is carried within the signal itself, a technique called isochronous timing.

The physical interface for a DS1-rate facility is made up of four wires altogether, two of which are used for the transmit signal and the other two for the receive signal.

A terminal attached to such a facility — multiplexer, channel bank or private branch exchange (PBX) — derives the timing by considering the frequency with which the bits appear in the received signal. The transmission interface requires sufficient one-bits in the signal to ensure that the timing can be maintained. That requirement is termed "ones-density."

Timing problems

The problem with timing digital transmission networks is that a number of different devices may have to be interconnected to the same network and made to operate in conjunction with the same master timing source.

Unfortunately, no handy procedure or checklist exists that can be used to make sure the timing plan is sound and will operate despite component outage. What is required is a basic understanding of the principles involved and the options available to implement the synchronization plan.

As bits pass between devices in a digital network, steps must be taken to ensure the transmitter sends a bit at the same time the receiver expects to receive one. If the devices send and receive at even slightly different rates, transmission errors eventually occur.

Slight timing differences crop up if different devices are allowed to transmit using only their own internal timing sources with no means of maintaining synchronization between them. This clock operation is called "freewheeling." The variation in timing is due to the timing circuits' limited sophistication, which is based on what can be cost-effectively built into network devices.

Buffers to treat symptoms

Buffers can be used to compensate for timing differences, but if a difference is significant or a timing source drifts too far, the buffers will eventually run full or empty.

When a buffer runs out of capacity, a function is implemented that causes the contents to be discarded — that is, it takes the bits in the buffer and throws them away. This will not drastically affect voice channels using 64K bit/sec. Pulse Code Modulation encoding, but it will definitely affect data transmissions in which every bit has meaning. Data errors introduced when the buffer is emptied will have to be corrected by the data link protocol.

If all network devices were made to operate at the identical bit rate, bits would not accumulate to fill up the buffers, and none would have to be lost to compensate for timing variations. That is the end goal of network synchronization.

A synchronization model

The most mature digital transmission network currently in existence is operated by AT&T Communications. We can use that digital transmission network as a model for how synchronization plans can be implemented.

In AT&T's network, hundreds of digital switching offices can be interconnected with digital trunking facilities, all of which must be synchronized to the same timing source. While each switching machine possesses its own internal timing source, it would be impractical to designate any one switch as the master timing source for the entire network.

What AT&T chose to do is to operate on a very precise timing source, an atomic clock, in Hillsboro, Mo., and then subordinate all the switching system clocks to that common reference. The timing reference produced in Hillsboro is called the Basic Synchronization Reference Frequency (BSRF), and it is fed to every digital switching office in the AT&T network, for example the Number 4 Electronic Switching System offices, and to each local telephone company's digital switching offices, for example the Number 5 Electronic Switching System and DMS100 offices.

There are two methods used to relay BSRF timing through the network. Major locations can receive the signal from an analog microwave network emanating from Hillsboro. If an office does not receive the timing signal directly, the timing can be carried on a digital transmission facility from a connected office.

If the timing is received from a communications facility, the office receiving the timing will use a phase-locked loop timing recovery process that locks all of its timing devices to the frequency of the bits being received. All bits transmitted from that office will then be sent based on that same frequency, which is traceable to the BSRF. The clock moves in a hierarchical fashion, with each office usually connected to more than one source for the timing.

Along with the basic distribution plan, there are also backup plans. In the event that an office loses the transmission link that provides its timing reference, that office will immediately look to its defined backup. If all of its backups fail, that office begins to use its own internal timing source — freewheeling, or operating independently of the BSRF. In that case, the office that is freewheeling is more likely to experience errors on a transmission link connected to an office that is linked to the BSRF.

Asynchronization between two offices does not always cause data errors. With luck, everything continues to work perfectly. It is not advisable, however, to depend too heavily on luck in a network design.

AT&T also defines the accuracy of the clocking sources used in various switching offices by assigning each to a category called a Stratum.

Stratum I refers to the atomic clock located in Hillsboro. Network switches operate at either Stratum II or Stratum III accuracy. AT&T's Technical Reference 60110 describes the plan and defines the accuracy at each Stratum. However, even if a device possesses a Stratum III internal clock, it will normally operate at Stratum I accuracy if its timing is traced to the BRSF.

Keeping in step

Most users cannot afford to maintain atomic clocks. Even if they did, they might still have to interface to facilities in a carrier network that were tied to the carrier's clock source.

In the AT&T network, that clock source is the BSRF, and the user must synchronize his clock to that clock source if he is connected by a digital transmission facility to either a digital network switch or to a digital cross-connect system like the AT&T Digital Access Cross-Connect Systems link.

An example of that requirement might be a DS1-rate trunk access to AT&T's Megacom service. Normally, one user device, such as a PBX or a multiplexer, is slaved to an AT&T timed service, and that device is then used as a master timing source on communications channels to other customer network devices.

The synchronization issue becomes more complex if the customer is using digital channels from a number of carriers that do not use the same master timing reference. For example, MCI Communication Corp.'s network timing is provided by Loran C, an atomic clocking source maintained by the U.S. government, not the BSRF. In that case, the customer's device must provide buffering to compensate for any difference between the two carriers' master clocks. The buffers should be sized for the worst possible timing variance that could occur between the two master clocks, based on the timing accuracy at the point where the customer accesses the carrier's network.

This buffering process is usually easier said than done. Vendor support for synchronization planning has not progressed at the same rate as customers' requirements.

There is nothing mystical about network synchronization; it is merely one of the basic crafts in digital network design. As the network grows larger and more devices are connected to it, the synchronization plan becomes more and more complex, but the same techniques are always applied.

As time goes on, vendors and users of telecommunications will develop these skills. For now, though, we operate in "learn as you go" mode. •

ASYNCHRONIZATION between offices does not always cause data errors. With luck, everything continues to work perfectly. It is not advisable, however, to depend too heavily on luck in a network design.

Finneran is president of dBrn Associates, Inc. and conducts the Business Communications Review Seminar on T1 networking.

VENDOR VIEWPOINT
More muscle needed to support new uses

BY WILLIAM A. FLANAGAN

T1 networking is stimulating a great deal of activity right now. Is it all mere hoopla, or will this commotion eventually lead to something? Does anybody really need 80, 90 or 100 T1 lines in a single node? Or is it a case of "My dog is better than your dog?"

Emerging user applications and accepted carrier services will eventually decide the point. Already, they seem to be indicating a trend toward escalation in size and sophistication of customer-premise equipment.

Large nodes will offer more T1 lines, more throughput and more voice/data I/O ports. In some hubbing situations, a T1 node with 100 links and 2,000 ports makes sense. Not every company needs such capacity, though, and fewer still need more than one or two nodes of that size, even in networks of a hundred locations. But the option is nice to have if you hope to grow your network along a relatively easy migration path.

Actually, the "option" for growth is hardly an option at all. Consider the three laws of data communications:

- Networks never get smaller.
- Networks never get slower.
- Networks never stay the same.

Bandwidth needs will grow at a rapid pace. Computer-aided design and manufacturing, graphics, teleconferencing and other visual transactions, beyond the demands of voice, eat up huge chunks of bandwidth. Applications that have graphics on-line will raise the bandwidth requirement for terminal support by an order of magnitude from that for text-based terminals. Where analog lines were once sufficient, T1 lines will be needed. Where one T1 line is used now, many will be required.

As T1 lines multiply, communications managers will notice that tariffs for digital transmission favor T3 to replace as few as five T1 lines. Suddenly, there are 28 T1s to terminate. The larger T1 nodes will come in handy; today's T3 multiplexers are relatively simple, point-to-point devices without switching functions.

Cheaper bandwidth will make applications economical that previously were not.

AT&T's Digital Access Cross-Connect Systems (DACS) compatibility on the T1 link will be necessary but not sufficient for market viability. Compatibility will be necessary because DS0 channelization will dominate the carrier offerings for voice and data.

To get the new, sophisticated services, end users will need compatible customer-premise equipment. At present, this is the D3/D4 format with standard Superframing. The D5 channel bank format, with the extra diagnostic ability of the Extended Superframe (ESF), formerly known as Framing Extended, will gradually replace D4 or Superframe. Customer-premise equipment will have to keep up.

On the other hand, proprietary formats make most efficient use of a T1 data link. By ignoring the 64K bit/sec. boundaries of voice channels, flexible formats pack more connections — voice as well as data — into the available bandwidth. Would you rather have 96 or 150 channels at 9.6K bit/sec. in your T1? Eliminating waste still means something for transcontinental T1 lines, even after tariff reductions.

> WHERE analog lines were once sufficient, T1 lines will be needed. Where one T1 line is used now, many will be required.

Note that both formats, private and public, will be used in the same network. The relative balance will fall somewhere between two extremes:

- Almost all private format on leased lines with a few gateways into public networks for backup and disaster recovery.
- Almost all public, for example a software-defined virtual network, with one or a few high-density corridors on leased or private facilities.

Either of these, and everything in between, is a hybrid network. A hybrid will be the solution of choice in most large corporations, so T1 nodes must support both — simultaneously.

Keep in mind, though, that proprietary formats (those not divided into 24 channels) must be framed in Superframe or ESF to be carried by AT&T and some other carriers. In other words, proprietary formats must have the proper bit pattern in every 193rd position.

Voice compression is a corollary to proprietary framing. The standard technique today — 32K bit/sec. Adaptive Differential Pulse Code Modulation — as specified by the American National Standards Institute and the Consultative Committee on International Telephony and Telegraphy — still possesses some redundancy. Theoretically, toll-quality voice needs less than 16K bit/sec. Getting down there in the next few years is going to be a race, however. Encoding standards will take at least that long to settle.

On top of encoding to get 2-to-1 or 4-to-1 compression, the clever T1 network will apply digital speech interpolation. By taking advantage of the pauses in normal conversation, special equipment options will statistically multiplex voice for an additional compression of 2-to-1 or more. Compared with Pulse Code Modulation, a compression of up to 10-to-1 seems possible.

Customer-controlled reconfiguration will migrate, probably in many little steps, to Integrated Services Digital Network (ISDN). The controlling factor will be the speed with which the carriers install digital central offices and digital loop equipment.

End-office central offices in the U.S. relied mostly on analog switches until as late as 1983. While many of those switches enjoyed stored-program control — they were "computerized" — the switching matrix itself was analog.

In the last two years, a global stampede has raced to replace this type of analog machine with digital switches. Canada's central offices are almost entirely digital now, having converted in the last two years. The UK and most European countries are in the midst of complete overhauls. The U.S. lags, in part because electronic enhancements to analog switches offer most of the features of digital devices. Such add-ons even provide for data handling. Future ISDN networks, however, will require digital switches. In the meantime, keep an eye out for DACS and similar products to appear as customer-premise equipment, not just in the central office.

Voice and data integration will not be complete in customer-premise equipment for some years to come. Voice private branch exchanges (PBX) can handle data but at a higher price than data-oriented switches. There is also a question of availability. If voice and data are in the same basket and the basket breaks, do you think you will really want to eat that many scrambled eggs?

The T1 resource manager or network exchange possesses internal redundancy and the ability to find alternate routes for failed connections lacking in most PBXs. Separate administrators for voice and data will also tend to keep the switching functions apart, while the corporate information officer will demand their integration for transmission economy.

More and more functions have migrated inside the T1 "multiplexer," until it has been necessary to find a new name for this class of device to distinguish it from a common time-division multiplexer or channel bank.

Today, the network exchange, or resource manager, is a node of many functions. It not only will multiplex almost any kind of digital information, but it will automatically find alternate routes around failures, cross-connect DS0s, bypass or drop/insert any standard bit-rate channel, allocate bandwidth on demand, offer test access and function as a matrix switch at various standard data rates.

The evolution is probably still far from compelete. Communications needs promise to propel the high end of the market ever further. •

Flanagan is senior manager at Timeplex, Inc. in Woodcliff Lake, N.J. Before he joined Timeplex, his marketing firm worked on introducing Dataphone II service. He is the author of a recent book, *The Teleconnect Guide to T1 Networking* (Teleconnect Library, 1986).

Going beyond T1 speeds to DS2, DS3 and higher

T1 ranks low on the digital transmission hierarchy

While most of the current activity in digital private networks centers on 1.544M bit/sec. channels, that rate actually represents only the lowest speed digital transmission facility used in a common carrier's network.

In a carrier's transmission network, be it a local-exchange carrier or an interexchange carrier, 1.544M bit/sec. signals are carried on repeatered wire-pair facilities. That is the real meaning of a T1 Carrier System.

Higher capacity transmission systems such as digital radio, digital coaxial and fiber-optic systems can carry many times that 1.544M bit/sec. rate, and, consequently, a number of 1.544M bit/sec. channels are multiplexed to form the higher bit streams that drive those transmission systems.

In order to standardize on one set of multiplexers, and thereby reduce the cost of the network, AT&T Bell Laboratories developed a standard hierarchy of digital transmission rates for use in the AT&T network. That hierarchy is also used to structure local telephone company transmission systems and other common carrier networks. An understanding of this structure allows a network planner to recognize potential difficulties that may occur in digital networks and to anticipate digital services that carriers are able to provide most readily.

The digital network hierarchy defines a number of signal rates, each of which is designated as Digital Signal (DS), followed by a number.

The 1.544M bit/sec. data rate of the T1 Carrier Systems is the basic building block of the hierarchy and is termed DS1. The real T1 Carrier System operates only on wire-pair transmission facilities, while DS1-rate channels can be carried on any transmission medium. When describing one of the 64K bit/sec. digital channels carried in a DS1, those channels are referred to as DS0.

Stacking signals

In the multiplexer hierarchy, four DS1 signals are multiplexed to form a DS2 signal, which operates at 6.312M bit/sec. and carries 96 DS0 channels. There is a wire-pair carrier system called the T2 that operates at this rate, but its use is minimal.

The problem with the T2 carrier is that it requires special low-capacitance cable and will not operate on the standard plastic-insulated cable used for T1 carrier transmission.

A third wire-pair carrier system called the T1C was also developed. This carrier system operates at a speed of 3.152M bit/sec. and carries 48 DS0s. The 3.152M bit/sec. rate is termed a DS1C, but few T1C Carrier Systems are actually used.

> TELEPHONE companies and long-distance carriers have been trying to minimize the digital signal rates they use in order to limit the amount of test equipment and testing points in the network.

Building DS3

Seven DS2 signals are further multiplexed to form a DS3 signal, which operates at a speed of 44.736M bit/sec. and carries 28 DS1 signals for a total of 672 DS0 channels. (Twenty-four DS0s in each multiplied by 28 DS1s equals 672.) The DS3 rate is the standard electrical interface rate for all high-speed digital facilities. For example, a 139M bit/sec. fiber transmission system can carry three DS3 channels. The 139M bit/sec. fiber terminal would house three DS3 electrical interfaces.

A number of carriers, including AT&T Communications, are currently offering DS3-rate private-line services. A smaller number of carriers also offer a DS2-rate service.

A DS4 signal was also defined. This signal is made up of six DS3-rate channels and operates at a speed of 274.176M bit/sec. The DS4 signal could be carried on coaxial facilities, but the carriers have all but stopped building coaxial cable systems, and the DS4 signal rate is beginning to look like an anachronism.

Standards attempted

Telephone companies and long-distance carriers have been trying to minimize the number of digital signal rates they use in order to limit the amount of test equipment and testing points in the network, and they have been standardizing on DS1 and DS3 rates.

Eventually, the standards hierarchy will have to be extended to standardize on higher rates, but at this time, standards

are defined only to DS3. Each transmission system manufacturer accepts inputs at DS3 and then uses a proprietary format to multiplex to higher rates. Obviously, the higher speed channel must also be demultiplexed to the DS3 level in that same manufacturer's equipment in order to allow connection to other vendors' devices.

AT&T publishes the "Digital Multiplexes Requirements and Objectives" in Bell System Technical Reference PUB 43802, but the multiplexers themselves are available from a number of suppliers, including AT&T Network Systems, Northern Telecom, Inc. and Rockwell-Wescom, Inc. While some multiplexers do go from DS1 to DS2 rates and from DS2 to DS3, called M12 and M23 multiplexers, respectively, the most popular kind, the M13 multiplexer, multiplexes 28 DS1 channels in DS3. An M13 multiplexer costs in the range of $10,000 to $15,000 per end.

Framing, stuffing bits

The DS1 signal is byte-level multiplexed; eight bits from each of the 24 channels are multiplexed into a frame that includes a framing bit. The multiplex format above DS1 calls for bit-level multiplexing. To generate DS2 and DS3 signals, additional framing and stuffing bits are added, which accounts for the differences between the input and output signal rates (1.544M bit/sec. multiplied by four does not, for instance, equal 6.312M bit/sec.).

ONE of the major problems carriers face with the current DS3 format is that it makes for additional expense in configuring a network.

The framing bits are used to identify and demultiplex the signal, and the stuffing bits compensate for timing differences that may occur among the various network components.

Also, the signal cannot be multiplexed directly from DS1 to DS3. Even though the multiplexer might take 28 DS1 inputs and produce one DS3 output, four DS1s are used internally to produce a DS2, and the seven DS2s are then multiplexed into a DS3.

Eliminating a step

One of the major problems carriers face with the current DS3 format is that it makes for additional expense in configuring a network.

Given the way the channels are multiplexed, it is impossible to build a simple-logic circuit that could monitor the composite DS3 signal and extract any one of the DS1's. The interface to digital switching systems is always at the DS1 level, so the entire DS3 signal must be demultiplexed to the DS1 level in order for channels to be interconnected. For a telephone company, this means a lot of M13 multiplex gear and a set of wire jumpers that would constitute an electrician's nightmare.

Recognizing this problem, Bell Communications Research Corp. defined a new plan for generating a synchronous DS3 signal. This plan is called Syntran.

The advantage of the Syntran signal is that it allows the telephone company to drop or insert DS1 signals without having to demultiplex the entire signal. At this time, little equipment exists that can generate Syntran-defined DS3 signals, but that is the next likely step in the migration.

A solid understanding of the carrier's network configuration can help a telecommunications planner determine what services the carrier is likely to offer. Further, as more user organizations begin to use DS3 as well as DS1 transmission facilities, they, too, will have to face the same network configuration decisions as the telephone companies.

It is hoped that by then the technical foundations will be laid and end users will be able to profit from the experience of the common carriers. •

MICHAEL FINNERAN

Digital multiplex hierarchy

The structural increments

Digital Signal	*Bit Rate**	*DS0 Channels*	*DS1 Channels*	*Media Used*
0	.064	1	1/24	Wire pair
1	1.544	24	1	Wire pair
1C	3.152	48	2	Wire pair
2	6.312	96	4	Low-capacity cable
3	44.736	672	28	Digital radio fiber
4	274.176	4,032	168	Coaxial cable

*Millions of bits per second.

CW CHART

Doors open for channel access testers

BY GEORGE CHOW

As a result of the rapid growth in both public and private networks, the market for digital-transmission test equipment is expanding quickly. T1 channel access test equipment is a good example of this family of products. It also exhibits one of the highest growth potentials.

Channel access test equipment can access any one of the 24 individual 64K bit/sec. channels on a T1 line. Its monitoring features include channel access decoding, error-performance monitoring and integrity checking. Transmission test capabilities include local and remote loop-back and bit pattern synthesis. The base price ranges from $2,000 to $7,000 and, with options, from $3,000 to $15,000.

Each of these units is transportable — suitcase-size or smaller. Less than 50% offer loop-back capabilities. Remote control allows the loop-back on one channel access tester to be operated by the controls on another. This is accomplished by loop-up and loop-down codes embedded in the digital bit stream.

Approximately half of the channel access test equipment available offers software configurability. Software configurability provides for control of the channel access test unit via a terminal console connected to or built-in to the device itself. Tests and measurements are run from software programs rather than with built-in knobs and switches.

Although only a few of the units currently offer Extended Superframe testing capability (CRC-6 and so on), most vendors indicate they plan to incorporate it.

About half of the channel access test equipment features bit-error rate, built-in jitter and A and B signaling tests. The other half provides access for additional equipment to perform these tests.

The demand for T1 carrier services will continue unabated through 1988. The telephone companies and common carriers will be the first to experience overcapacity of T1 channel access test equipment, but not until 1990 or later. Meanwhile, demand from end users — first large corporations, then smaller companies — will eventually exceed telephone company buying as end users realize the need for drop-and-insert testing equipment.

The need for channel access test equipment's featuring both voice and data measurement already exists. Increased complexity of the equipment and the drive to all-digital testers is now breeding the personal computer-based test unit. As a result, the price of test units should increase significantly during the next few years.

The total market for T1 channel access test equipment in 1986 was estimated to have been $25 million. Its growth rate — initially projected at 40% — increases to 60% as end-user orders increase and more complex software-driven units bearing higher price tags enter the market. The burgeoning demand for T1 transmission lines will continue to fuel the growth for the T1 test equipment industry overall.

Total dollar sales of T1 channel access test equipment increased 40% from 1986 to 1987 and should increase 60% through 1988. This growth pattern reflects the delay between installation of T1 transmission facilities and sufficiently sophisticated use to warrant the purchase of related test equipment. •

Chow is president of Able Communications, a Milpitas, Calif., telecommunications market research and consulting firm specializing in digital transmission.

Current market leaders

The following are considered the primary products in this industry:

- ADC Telecommunications 2200
- Advent Communications Technology, Inc. 8401
- Advent Communications 8460
- Berry Electronics, Inc. 966A with Option 5
- Calculagraph Co. TCIM
- Compression Telecom Corp. TCAT 241
- Hekimian Laboratories, Inc. 3705
- Hekimian 3962
- Hewlett-Packard Co. 3776A/B
- HP 3779C/D
- LP Com TC-2000
- Phoenix Microsystems, Inc. 5148
- Sage Instrument 930A
- Sierra 411B
- Sierra 411D
- Sierra 4017
- T-COM 220A & 515A
- T-COM 320A & 515A
- Tekelec 820A
- Venator Systems Vencat-24
- Venator Systems Vencat-1A
- Wandel & Goltermann, Inc. PCD-2, PCG-2
- Wilcom Products, Inc. T308-01A

GEORGE CHOW

T1 multiplexers

COMPANY	PRODUCT	MAXIMUM DATA CHANNELS SUPPORTED	POINT-TO-POINT OR MULTIPOINT	BANDWIDTH REQUIREMENT FOR OVERHEAD	ASYNCHRONOUS DATA CAPABILITY	ASYNCHRONOUS SPEED	SYNCHRONOUS SPEED	BIT INTERLEAVED OR BYTE INTERLEAVED	FRAMING STRUCTURE	INTERFACES SUPPORTED	VOICE CAPABILITY	VOICE-COMPRESSION METHOD	DROP AND INSERT CAPABILITY	NETWORK CONTROL SYSTEM	REMOTE MULTIPLEXER DOWNLOAD CAPABILITY	AUTOMATIC REROUTING CAPABILITY	PRICE	DIAL-INQ READER SERVICE NUMBER
Able Computer (714) 979-7030	T1 Master	NA	Point-to-point	25%	No	NA	1M bit/sec.	Bit	D4, Extended Superframe	RS-422, NRZI	No	NA	No	No	No	No	Contact vendor	910
AEG Bayly, Inc. (416) 683-8200	Omniplexer	288	Multipoint	33%	Yes	75 to 19.2K bit/sec.	Up to 56K bit/sec.	Byte	D4	V.35, RS-232, RS-449, G-703	Yes	PCM[1], ADPCM[2]	Yes	No	No	No	$5,000-$7,000	911
Amdahl Communications Systems Division (214) 699-9500	Multistar II T1 Multiplexer	92	Point-to-point	2%	Yes	110 to 19.2K bit/sec.	9.6K to 2.048M bit/sec.	Bit	Optional D4	V.35, RS-232C, V.24, MIL 188-114, Bell 303, RS-422, RTZ, fiber-optic	Yes	ADPCM, AECVSD[3]	No	Yes	Yes	No	$7,000-$15,000	912
	Multistar III T1 Multiplexer	92	Multipoint	2%	Yes	110 to 19.2K bit/sec.	1.544M to 2.048M bit/sec.	Byte	D4, optional Extended Superframe	V.35, RS-232C, V.24, MIL 188-114, Bell 303, RS-422, RTZ, fiber-optic	Yes	ADPCM, AECVSD	Yes	Yes	Yes	No	$9,000-$25,000	
	Multistar IV T1 Multiplexer	900+	Multipoint	1% or less	Yes	1,200 to 19.2K bit/sec.	1.544M bit/sec.	Byte	D4, Extended Superframe	V.35, RS-232C, V.24, MIL 188-114, Bell 303, RS-422, RTZ	Yes	ADPCM, AECVSD	Yes	Yes	Yes	Yes	$33,000-$65,000 per node, one-time $22,000 for network management	
American Photonics, Inc. (203) 775-8950	AFM4500	8	Point-to-point	1%	Yes	Up to 56K bit/sec.	1.544M bit/sec.	Bit	Proprietary	RS-442, T1	Yes	PCM	No	No	No	Yes	$3,400	913
ARK Electronic Products (800) 228-0914	Arkmux T1	96	Multipoint	0%	Yes	50, 38,400 bit/sec.	Up to 19.2K bit/sec.	Bit	DS1	V.35, RS-232, RS-422	Yes	PCM, ADPCM	No	Yes	Yes	Yes	$9,500	914
AT&T (800) 247-1212	Dataphone II 740 Acculink Multiplexer	128	Both	2%	Yes	300 to 19.2K bit/sec.	75 to 1.31M bit/sec.	Bit	D4, Extended Superframe	V.35, RS-232, RS-449, MIL 188	Yes	PCM, ADPCM	No	Yes	Yes	No	$15,000-$85,000	915
	DDM 1000 Ds3 Multiplexer	672	Point-to-point	1% or less	Yes	19.2K bit/sec.	NA	Bit	D4, Extended Superframe	V.35, RS-232, RS-449, RS4, X.21, X.25	Yes	ADPCM	Yes	No	Yes	No	$15,000-$40,000	
	Channel Division Multiplexer	24	Point-to-point	1% or less	Yes	Up to 19.2K bit/sec.	2.4K to 1.544M bit/sec.	Bit	D4	V.35, RS-232, RS-449, RS4, X.21, X.25	Yes	ADPCM	Yes	No	No	No	$4,000-$8,000	
	Bit Compression Multiplexer (BCM 32000)	48	Point-to-point	8% or less	Yes	Up to 19.2K bit/sec.	Up to 64K bit/sec.	NA	D4	V.35, RS-232, RS-449, RS4, X.21, X.25	Yes	ADPCM	No	Yes	No	No	$6,000-$9,000	
	AT&T D4 Channel Bank	120	Point-to-point	10% or less	No	NA	2.4K to 64K bit/sec.	Bit	D4, Extended Superframe	V.35, RS-232, RS-449, RS4, X.21, X.25	Yes	ADPCM	No	No	No	No	$7,000-$13,000	
Avanti Communications Corp. (401) 849-4660	Open Network Exchange	7,400	Multipoint	1% or less	Yes	19.2K bit/sec.	1.5K bit/sec.	Byte	D3, D4, Extended Superframe	V.35, RS-232, RS-499, X.21	Yes	PCM, ADPCM	Yes	Yes	Yes	Yes	$30,000-$100,000	916
	Ultramux	192	Multipoint	1% or less	Yes	75 to 9.6K bit/sec.	2,400 to 1.5M bit/sec.	Bit	D3, D4, Extended Superframe	V.35, RS-232, RS-499, X.21	Yes	PCM, ADPCM, CVSD[4]	Yes	Yes	Yes	Yes	$15,000-$80,000	
	Ultrapac	32	Point-to-point	2%	Yes	75 to 9.6K bit/sec.	2,400 to 1.5M bit/sec.	Bit	D4	V.35, RS-232, RS-499, DSX1, V.24	Yes	ADPCM, CVSD	No	Yes	Yes	No	$15,000	
Aydin Monitor Systems, Inc, (215) 657-7450	6248A-10	120	Point-to-point	0%	No	NA	1,200 to 768K bit/sec.	Bit	D4	V.35, RS-232, RS-449, 4-wire ENM	Yes	VQL[5]	No	No	No	No	Contact vendor	917
	6248A-20	120	Multipoint	0%	No	NA	1,200 to 768K bit/sec.	Both	D4	V.35, RS-232, RS-449, 4-wire ENM	Yes	VQL	Yes	Yes	Yes	Optional	Contact vendor	
	6296	120	Point-to-point	0.40%	No	NA	1,200 to 768K bit/sec.	Bit	D4	V.35, RS-232,	Yes	VQL/DSI[6]	No	Yes	Yes	No	Contact vendor	
Canoga-Perkins (818) 888-2003	3248	8	Point-to-point	NA	Yes	1.544M bit/sec.	NA	Bit	DS1	T1	No	NA	No	No	No	No	$3,000-$4,500	918
	3124	192	Both	5%	Yes	Up to 19.2K bit/sec.	Up to 512K bit/sec.	Bit	D4	V.35, RS-232, RS-422, TCM Voice	Yes	PCM	Yes	Yes	Yes	Yes	$9,000-$40,000	
Coastcom (800) 433-3433	Stepnet	288	Both	NA	Yes	Up to 19.2K bit/sec.	2,400 to 1.536M bit/sec.	Byte	D4	V.35, RS-232, RS-449	Yes	PCM, ADPCM	Yes	Yes	Yes	No	$19,000-$44,000	919
Codex Corp. (617) 364-2000	6240	96	Multipoint	10%	No	NA	Up to 1.2M bit/sec.	Bit	D4	V.35 RS4,RS-232, RS-449	Yes	PCM, ADPCM	Yes	Yes	Yes	Yes	$20,000-$63,000	920
Datatel, Inc. (800) 424-4451	DCP 9100 T1 Data/Voice Multiplexer	96	Point-to-point	0%	Yes	Up to 19.2K bit/sec.	Up to 1.536K bit/sec.	Both	D4, Extended Superframe	V.35, RS-232, RS-449	Yes	PCM, ADPCM	NA	Yes	Yes	No	$4,000-$4,400	921
	DCP 9800 T-1 Network Switch	960	Point-to-point	4%	Yes	Up to 19.2K bit/sec.	Up to 1.536K bit/sec.	Byte	D4, Extended Superframe	NA	Yes	NA	Yes	Yes	Yes	Yes	$9,350	
Digital Communications Associates/Cohesive Network Corp. (408) 370-4100	System 9000	144	Multipoint	0.40%	Yes	50 to 19.2K bit/sec.	1,200 to 1.536M bit/sec.	Byte	D4, Extended Superframe	V.35, RS-232, RS-422, RS-449	Yes	ADPCM	Yes	Yes	Yes	Yes	$13,700-$120,000	922

[1]Pulse Code Modulation [2]Adaptive Differential Pulse Code Modulation [3]Amdahl Enhanced Continuously Variable Slope Delta [4]Continuously Variable Slope Delta Modulation [5]Variable Quantizing Level [6]Digital Speech Interpolation [7]Variable Companding Pulse Code Modulation [8]Advanced Signal Processor [9]Vector Quantization Coding [10]Adaptive Speech Interpolation.

The companies included in this chart responded to a recent telephone survey conducted by *Computerworld*. Further product information is available from vendors.

COMPANY	PRODUCT	MAXIMUM DATA CHANNELS SUPPORTED	POINT-TO-POINT OR MULTIPOINT	BANDWIDTH REQUIREMENT FOR OVERHEAD	ASYNCHRONOUS DATA CAPABILITY	ASYNCHRONOUS SPEED	SYNCHRONOUS SPEED	BIT INTERLEAVED OR BYTE INTERLEAVED	FRAMING STRUCTURE	INTERFACES SUPPORTED	VOICE CAPABILITY	VOICE-COMPRESSION METHOD	DROP AND INSERT CAPABILITY	NETWORK CONTROL SYSTEM	REMOTE MULTIPLEXER DOWNLOAD CAPABILITY	AUTOMATIC REROUTING CAPABILITY	PRICE	DIAL-INQ READER SERVICE NUMBER
Dynatech Communications, Inc. (401) 884-9075	Intelink	288	Multipoint	12%	Yes	75 to 19.2K bit/sec.	2,400 to 1.536M bit/sec.	Byte	D4, Extended Superframe	V.35, RS-232, MIL 188, RS-449, RS-422, MIL 188/114, DS0-DP, OCU-DP	Yes	PCM, ADPCM, VCPCM[7]	Yes	Yes	Yes	Yes	$3,000-$35,000	923
	Intelink Digital Cross Connect	584	Multipoint	0%	No	NA	1.544M to 2.048M bit/sec.	Byte	D4, Extended Superframe	RS-422, T1	Yes	PCM, ADPCM, VCPCM	No	Yes	Yes	Yes	$3,500-$10,000	
Emulex Corp. (714) 662-5600	CS41	144	Point-to-point	0%	Yes	50 to 19.2K bit/sec.	NA	Bit	D4	RS-232C/V.28 or RS-423 A/V.10/X.26	No	NA	Yes	No	Yes	NA	$5,500	924
Gandalf Data, Inc. (312) 541-6060	GLM 528E	128	Both	0.50%	Yes	Up to 19.2K bit/sec.	Up to 64K bit/sec.	Bit	Proprietary	RS-232, V.24, 50-pin J-type Telco connector	No	NA	Yes	No	No	No	$3,475	925
General Datacomm, Inc. (203) 574-1118	Megaswitch	512	Both	2%	Yes	75 to 19.2K bit/sec.	300 to 1.152M bit/sec.	Bit	Proprietary (Autoframe)	RS-232, RS-422, CCITT, V.10, V.11, V.24, V.35, MIL 188, CCITT, G-703	Yes	PCM, ADPCM, CVSD, ASP[8] (Proprietary)	Yes	Yes	Yes	Yes	$20,000-$200,000	926
	Megamux	54	Point-to-point	2%	Yes	50 to 9.6K bit/sec.	300 to 1.024M bit/sec.	Bit	Proprietary (Autoframe)	RS-232, RS-422, RS-423, CCITT, V.10, V.11, V.24, V.35, MIL 188, CCITT G-703	Yes	CVSD	No	Yes	No	NA	$10,000-$40,000	
	Megamux Plus	54	Point-to-point	2%	Yes	75 to 19.2K bit/sec.	300 to 1.152M bit/sec.	Bit	Proprietary (Autoframe)	RS-232, RS-422, RS-423, CCITT, V.10, V.11, V.24, V.35, MIL 188, CCITT G-703	Yes	PCM, ADPCM, CVSD, ASP (Proprietary)	No	Yes	Yes	NA	$10,000-$40,000	
Granger Associates (408) 727-3101	CP 2000	200	Both	1%	Yes	1,200 to 19.6K bit/sec.	1,200 to 1.536M bit/sec.	Bit	D4	V.35, RS-232, RS-422, 4-wire ENM-type 1-, 2-, 3-, 4-, 5-, 2-wire FXS	Yes	T1Y1, ADPCM	Yes	Yes	No	No	$20,000	927
Infinet, Inc. (617) 681-0600	ITM 1536	144	Multipoint, 36 T1	0.50%	Yes	50 to 19.2K bit/sec.	1,200 to 1.536M bit/sec.	Byte	D4, Extended Superframe	RS-422	Yes	PCM, ADPCM	Yes	Yes	Yes	Yes	$20,000-$200,000	928
Infotron Systems Corp. (609) 424-9400	Infostream 1500	128	Multipoint	0.70%	Yes	50 to 19.2K bit/sec.	64K to 1,024K bit/sec.	Byte	D4, Extended Superframe, Digital Access Cross-Connect Systems Link	V.35, RS-232, RS-422	Yes	PCM, ADPCM	Yes	Yes	Yes	Yes	Contact vendor	929
Integrated Telecom Corp. (214) 234-3340	Accudacs	64	Multipoint	1%	Yes	Up to 19.2K bit/sec.	2,400 to 1.536M bit/sec.	Byte	D4	V.35, T1, RS-232, RS-449	Yes	ADPCM	Yes	Yes	Yes	Yes	$8,000-$30,000	930
Megaring Corp. (516) 435-4666	CMX-T series Multiplexer	192	Both	0.50%	Yes	Up to 9.6K bit/sec.	56K to 64K bit/sec.	Byte	D4	V.35, RS-232, RS-422	Yes	PCM	Yes	Yes	Yes	No	$3,995	931
Micom Systems, Inc. (800) 642-6687	Instatrunk480 T1 Local Multiplexer	128	Both	1%	Yes	19.2K to 9.6K bit/sec.	NA	Bit	Unformulated T1	RS-232	No	NA	No	No	Yes	No	$3,600-$12,600	932
Network Equipment Technologies, Inc. (415) 366-4400	IDNX/70	400	Multipoint	1.50%	Yes	1,200 to 19.2K bit/sec.	1,200 to 1.344M bit/sec.	Bit (proprietary)	D3/D4	V.35, RS-232, RS-449, RS-422	Yes	CCITT ADPCM, DSI	Yes	Yes	Yes	Yes	Contact vendor	933
	IDNX/40	68	Multipoint	1.50%	Yes	1,200 to 19.2K bit/sec.	1,200 to 1.344M bit/sec.	Bit (proprietary)	D3/D4	RS-232, V.25, RS-449, RS-422	Yes	CCITT ADPCM, DSI	Yes	Yes	Yes	Yes	Contact vendor	
Network Switching Systems, Inc. (617) 470-2853	N16 Switch	320	Point-to-point (and network)	4%	Yes	1,200 to 19.2K bit/sec.	2,400 to 768K bit/sec.	Bit	D4, Extended Superframe	V.35, RS-232, 4-wire ENM	Yes	ADPCM	Yes	Yes	Yes	Yes	$70,000-$150,000	934
Newbridge Networks, Inc. (703) 834-3600	3600 Mainstreet Bandwidth Manager	144	Multipoint	3.50%	Yes	Up to 19.2K bit/sec.	1.544M to 2.048M bit/sec.	Byte	D4	V.35, 1-5 loopstart groundstart trunk, X.21, direct-connect card, T1, CEPT	Yes	ADPCM, VQC[9]	Yes	Yes	Yes	Yes	$10,000-$30,000	935
Paradyne Corp. (813) 530-2222	3210	96	Both	0.50%	Yes	600 to 38.4K bit/sec.	2,400 to 1.536M bit/sec.	Both	Superframe, Extended Superframe	RS-232, V.39, RS-449	Yes	PCM, ADPCM, CVSD	Yes	Yes	Yes	Yes	$10,000-$30,000	936
Pulsecom Division/ Hubbell, Inc. (800) 841-1005	PD4 T1 Multiplexer	48	Point-to-point	0%	No	NA	2,400 to 64K bit/sec.	Byte	D3, D4, Extended Superframe	V.35, RS-232, RS-449,	Yes	ADPCM	No	No	No	No	Contact vendor	937
RAD Data Communications, Inc. (201) 587-8822	Megaplex-1	20	Point-to-point	16%	No	NA	56K to 768K bit/sec.	Bit	Digital Access Cross-Connect Systems-compatible	V.35, RS-422, CSU Cross-connect	Yes	ADPCM, CVSD	Yes	No	Yes	No	$4,500	938
Raycom Systems, Inc. (303) 530-1620	5100 series	144	Point-to-point	0.05%	Yes	Up to 19.2K bit/sec.	1.544M bit/sec.	Bit	NA	V.35, RS-232, RS-422, IBM 3270	No	NA	Yes	No	No	Yes	$2,500-$10,000	939
Scitec Communications Systems (401) 849-4353	BSPT1	128	Point-to-point	0.10%	Yes	50 to 19.2K bit/sec.	50 to 1.344M bit/sec.	Bit	D4	V.35, RS-449, RS-232, RS-422, RS-423	Yes	CVSD	No	Yes	Yes	No	$6,100	940
Spectrum Digital Corp. (703) 478-0560	ISDX	508	Multipoint	0.40%	Yes	50 to 19.2K bit/sec.	2,400 to 2M bit/sec.	Bit	D3/D4, Extended Superframe	V.35, RS-232, DSX1, CCITT G-703, V.24, V.28, RS-449, RS-422	Yes	ADPCM, ASI[10]	Yes	Yes	Yes	Yes	$15,000-$100,000	941
Stratacom, Inc. (408) 370-2333	Integrated Packet Exchange	500	Multipoint	12%	Yes	Up to 19.2K bit/sec.	1.344M bit/sec.	NA	D4	V.35, RS-232, RS-449, V.24, 64K bit/sec. PCM voice, video	Yes	ADPCM, DSI	Yes	Yes	Yes	Yes	$15,000-$500,000	942
Tau-Tron, Inc. (617) 692-5100	Intraplex	168	Both	0.50%	Yes	Up to 19.2K bit/sec.	Up to 56K bit/sec.	Byte	D4	V.35, RS-232, RS-449	Yes	PCM	Yes	No	No	No	$3,250-$8,000	943

COMPANY	PRODUCT	MAXIMUM DATA CHANNELS SUPPORTED	POINT-TO-POINT OR MULTIPOINT	BANDWIDTH REQUIREMENT FOR OVERHEAD	ASYNCHRONOUS DATA CAPABILITY	ASYNCHRONOUS SPEED	SYNCHRONOUS SPEED	BIT INTERLEAVED OR BYTE INTERLEAVED	FRAMING STRUCTURE	INTERFACES SUPPORTED	VOICE CAPABILITY	VOICE-COMPRESSION METHOD	DROP AND INSERT CAPABILITY	NETWORK CONTROL SYSTEM	REMOTE MULTIPLEXER DOWNLOAD CAPABILITY	AUTOMATIC REROUTING CAPABILITY	PRICE	DIAL-INQ READER SERVICE NUMBER
Tellabs, Inc. (312) 969-8800	Crossnet System	128	Both	1%	Yes	300 to 19.2K bit/sec.	1,200 to 1.31M bit/sec.	Bit	D3/D4, Extended Superframe	V.35, RS-232C, EIA RS-422, RS-423, MIL 188-114, 4-wire ENM, 2-wire FXS/FXO, DX, NSF, DS1-T1 Bipolar, AMI or B8ZS, T1 Bipolar AMI B828, CCITT V.35	Yes	PCM, ADPCM	Yes	Yes	Yes	Yes	$14,150-$91,200	944
Teltone Corp. (800) 426-3926	M-825 multiple	32	Point-to-point	NA	Yes	Up to 9.6K bit/sec.	NA	Bit	NA	RS-232	No	NA	No	No	No	No	$2,400	945
Timeplex, Inc. (201) 930-4600	Timeplex Link/2 Data/Voice Network Exchange	208	Multipoint	1% or less	Yes	Up to 19.2K bit/sec.	50 to 1.152K bit/sec.	Byte	DSX1/D4	RS-232, V.24, RS-422, V.11, RS-423, V.10, V.35, MIL standard 188-114, DSX1, CCITT G-703	Yes	PCM, ADPCM, CVSD, Link Packetized Voice Server	Yes	Yes	Yes	Yes	$12,865	946
	Timeplex Minilink/2 Data/Voice Network Exchange	24	Multipoint	1% or less	Yes	Up to 19.2K bit/sec.	50 to 1.152K bit/sec.	Byte	DSX1/D4	RS-232, V.24, RS-422, V.11, RS-423, V.10, V.35, MIL standard 188-114, DSX1, CCITT G-703	Yes	PCM, ADPCM, CVSD, Link Packetized Voice Server	Yes	Yes	Yes	Yes	$9,255	
	Timeplex Link/1 T1 Facilities Management System	208	Multipoint	1% or less	Yes	Up to 19.2K bit/sec.	50 to 1.152K bit/sec.	Byte	DSX1/D4	RS-232, V.24, RS-422, V.11, RS-423, V.10, V.35, MIL standard 188-114, DSX1, CCITT G-703	Yes	PCM, ADPCM, CVSD, Link Packetized Voice Server	Yes	Yes	Yes	Yes	$12,155	
	Timeplex Minilink/1 T1 Facilities Management System	24	Multipoint	1% or less	Yes	Up to 19.2K bit/sec.	50 to 1.152K bit/sec.	Byte	DSX1/D4	RS-232, V.24, RS-422, V.11, RS-423, V.10, V.35, MIL standard 188-114, DSX1, CCITT G-703	Yes	PCM, ADPCM, CVSD, Link Packetized Voice Server	Yes	Yes	Yes	Yes	$9,450	

Selected statistical multiplexer vendors

Case Communications, Inc.
(301) 290-7710

DCX850
The DCX850 communications processor integrates data concentration and data switching for up to 64,000 network ports and 256 contention groups. It supports data rates of up to 9.6K bit/sec., with up to 13 composite links transmitting to 72K bit/sec. Features include short-form addressing, automatic rerouting and automatic reporting of significant systems events.
Price: $22,500 - $65,000

DCX840
The DCX840 communications processor operates as an asynchronous or synchronous networking multiplexer with 240 asynchronous and 60 synchronous channels transmitting on 15 composite links. Its system test and configuration module allows the network operator to logically connect any multiplexer port on the network to any other. Modular design allows easy upgrade to the DCX850.
Price: $12,500 - $25,000

DCX836
The DCX836 communications processor provides point-to-point statistical multiplexing for up to 60 asynchronous or 30 synchronous channels with operating speeds ranging from 75 to 9.6K bit/sec. It provides compacted and accurate transmission on a single composite link up to 72K bit/sec.
Price: $6,000 - $22,000

DCX842
The DCX842 multiplexer is a feeder multiplexer for other Case DCX products. It can link any four multiplexers to a DCX840 or 850 communications processor through a single composite line running at up to 64K bit/sec. Each of the four attached multiplexers support up to 64 virtual channels.
Price: $2,350 - $2,750

DCX833
The DCX833 statistical multiplexer feeds both synchronous and asynchronous devices into DCX networks, enabling users to mix communications protocols in a single network. It can be configured with up to 12 asynchronous devices, one Case protocol link module and a single composite line to a Case DCX840 or 850 communications processor.
Price: $3,250 - $8,100

DCX825
The DCX825 statistical multiplexer offers point-to-point multiplexing with onward linking capacity, which allows remote multiplexers to transmit through a mid-point DCX825. The DCX825 supports up to 32 asynchronous channels and eight synchronous channels transmitted on a single composite link up to 19.2K bit/sec. It accepts asynchronous signals from 75 to 9.6K bit/sec. and synchronous inputs from 1,200 to 9.6K bit/sec.
Price: $3,500 - $7,000

DCX812
The DCX812 is a four- to eight-channel multiplexer. The channels support up to 9.6K bit/sec., while the composite link can operate up to 19.2K bit/sec. It offers diagnostic capability that isolates failures at local and remote sites.
Price: $1,495 - $1,895

DCX812M
The DCX812M has all the features of the DCX812 but incorporates a Case 4000-series diagnostic modem card, providing speeds of 9.6K bit/sec. and 14.4K bit/sec.
Price: $3,190 - $4,960

Codex Corp.
(617) 364-2000

Codex 6015
The Codex 6015 intelligent network processor provides data concentration for up to 16 terminals in point-to-point and Codex 6700-series (high-end nodal processors) networking applications. It includes a port-switching feature with contention. The multiprotocol software option allows support of 14 widely used synchronous protocols.
Price: $1,500 - $4,000.

Codex INP 6003
The Codex INP 6003 is a point-to-point statistical multiplexer supporting four to eight asynchronous terminal ports. It allows network access via two menu-driven software-controlled interfaces: one, an asynchronous nondedicated terminal that allows an operator to configure the Codex 6003 to accept data from any or all of the attached asynchronous devices and, the second, a front panel 32-char. LCD with membrane switches.
Price: $1,250 - $1,900.

Codex 6740 DCP
The Codex 6740 DCP delivers terminal ports that support interfaces for a mix of asynchronous, synchronous and bit-oriented protocols. Codex 6740 nodes support up to eight high-speed composite links ranging from 2,400 to 64K bit/sec.
Price: $6,000

Comdesign, Inc.
(805) 964-9852

TC-500A
The TC-500A statistical multiplexer concentrates up to 32 remote devices on one communications link. It features channel speeds to 9.6K bit/sec., front-panel or executive-port configurability, flow control and code conversion.
Price: $1,800

TS-600
The TS-600 switching multiplexer offers the features of TC-500A plus switching, port contention and synchronous protocol support. It offers an optional X.21 bis interface.
Price: $3,100

TS-1000
The TS-1000 switching multiplexer quad-link version provides cost-effective multisite connectivity and supports eight to 32 channels. The single-link version supports four to 32 channels. It is compatible with the full line of the company's Futurecom local- and wide-area networking products.
Price: $2,100

RS-2000
The RS-2000 networking multiplexer is a quad-link multiplexer that provides connectivity between multiple remote sites. It supports eight to 32 channels and includes switching, port contention and route-through. It is Futurecom compatible.
Price: $3,800

LS-2000
The LS-2000 local multiplexer supports up to 32 user devices or CPU ports, providing high-speed local channel switching, port contention, multilevel security, route-through capability and network management. It is Futurecom compatible.
Price: $2,800

US-2000
The US-2000 unibus multiplexer provides up to 64 virtual circuits between local or remote devices and Digital Equipment Corp. VAX/Unibus CPUs. It is available with an 802.3 interface or four RS-232C links and is Futurecom compatible.
Price: $7,500

Digital Communications Associates, Inc.
(404) 442-1000

DCA Series 100
The DCA Series 100 statistical multiplexers feature maximum channel capacities from eight to 32 network ports per unit and point-to-point or multidrop configurations. Key features include character compression, up to 32 asynchronous ports per unit, RS-232C and 20mA current loop interface, remote configuration and a console option for multiplexers. It is compatible with DCA Series 200 and 300 products.
Price: $1,495

DCA Series 200
The DCA Series 200 products are single hex-height modules that plug into the small-peripheral controller slots of Digital Equipment Corp.'s Unibus computers. It supports two 19.2K bit/sec. trunks and emulates up to 16 DZ 11s or DMF 32s. Key features include up to 128 asynchronous ports, character compression and remote configuration.
Price: $4,250

DCA Series 300
The DCA Series 300 is a family of network processors for private networks, offering a variety of functions — switching, routing, port contention, statistical multiplexing, protocol conversion and network management — all with an architecture allowing virtually unlimited flexibility in configuration. It has a bus speed of 4.27M bit/sec.
Price: $6,495

Gandalf Technologies, Inc.
(312) 459-6630

PIN 9103
The PIN 9103 is a stand-alone unit that accommodates four or eight channels, a rack-mount configuration for up to 32 channels, an input rate of up to 76.8K bit/sec. and asynchronous channel rates of up to 9.6K bit/sec.. Interfaces supported are RS-232C and V.24/V.28 compatibles. The PIN 9103 also supports a composite link operation to 19.2K bit/sec. with full X.25-level 2HDLC error detection and recovery and is suitable for operation on single-hop satellite links.
Price: $1,550 - $4,650

PIN 9106
The PIN 9106 is an asynchronous statistical multiplexer with two asynchronous channels operating at up to 9.6K bit/sec. or four at up to 4.8K bit/sec. Features include error correction, synchronous or asynchronous composite channels operating at up to 19.2K bit/sec., menu-driven parameter selection, hardware and software flow controls and indicators, local and remote loopback, downline loading of parameters and echoplex, autobod or fixed speed, battery backup and built-in Fox Research, Inc. test pattern. The system also provides answer control.
Price: $825 - $1,085

Switchmux
Switchmux integrates statistical multiplexing with data switching to offer line savings, error correction and data networking flexibility for up to 16 attached subscribers per node. Features include high-speed-subscriber data transfer over a 64K bit/sec. composite link; dual composite links for automatic fallback and load balancing; and activity log and Fox Research, Inc. message generator from any subscriber location.
Price: $2,650 - $3,850

General Datacomm, Inc.
(203) 574-1118

Gen-Net 1261
The Gen-Net 1261 is a point-to-point statistical multiplexer. It supports four or eight asynchronous channels operating at speeds up to 9.6K bit/sec. Features include dynamic buffering, downline loading of configurations, local echoplex, advanced diagnostics and performance monitoring.
Price: Contact vendor

Gen-Net 1262
The Gen-Net 1262 supports up to 96 channels including any combination of asynchronous and bisynchronous data formats and has a throughput of up to 256K bit/sec. It features channel priority on individual channels, operator-password security and an ASCII terminal interface to its internal control logic.
Price: Contact vendor

Gen-Net 1264
The Gen-Net 1264 is an intelligent, asynchronous channel-switching multiplexer. It accommodates up to 96 channels and four high-speed composites. Virtual circuits permit unrestricted channel routing across the network. Both models, the Basic and Enhanced 1264, allow channel and link configuration, status monitoring, local and remote diagnostics and statistics and alarm gathering.
Price: Contact vendor

Infotron Systems Corp.
(609) 424-9400

Supermux 600
The SM600 multiplexers are available in two models: the 16-channel SM616 and the 32-channel SM632. Both units support synchronous and asynchronous data transfers up to 9.6K bit/sec. Point-to-point and multipoint configurations are also supported. Switching and load balancing improve network efficiency. Front-panel indicators and switches display system status; automatic speed recognition eliminates separate speed-dedicated lines, ports and rotaries.
Price: $1,900 - $3,370

Supermux 380
The Supermux 380 concentrates up to eight asynchronous input lines on a single high-speed output. The inputs can be any combination of dial-up and dedicated lines with mixed protocols and speeds of up to 9.6K bit/sec. All eight inputs can be 9.6K bit/sec., and point-to point configurations are supported.
Price: $1,450 - $2,000

Micom Systems, Inc.
(805) 583-8600

Micom Box Type 2
Micom Box Type 2 features a modular design. The Featurepak design provides software flexibility by which a customer can change the operating characteristics of his Micom Box 2 simply by changing Featurepaks. Available Featurepaks include those for X.25, point-to-point and multipoint configurations.
Price: $1,490 - $3,990

Micom Box Type 3
Micom Box Type 3 features include wideband operation, supporting speeds to 72K bit/sec., a 56K bit/sec. integral ISU, which is completely concentrator-controlled, and synchronous channel operation. It also supports 19.2K bit/sec. on all channels.
Price: $1,790 - $4,290

Micom Box Type 5
The Micom Box Type 5 is a high-capacity 32-channel multiplexer with a standard RS-232 composite. Micom Box Type 5 modularity allows a customer to add new user channels by plugging in eight-channel expansion modules. No tools are required to install them. In addition to the modularity, Micom Box Type 5 Featurepaks are available in both compatible or enhanced types as well as integral ISU and a 16.8K bit/sec. integral modem.
Price: $3,050 - $5,450

Paradyne Corp.
(813) 530-2000

Model 2030
The Model 2030 represents the entry-level in the Paradyne multiplexer family. It is front-panel configurable and provides extensive diagnostics and statistics gathering. The unit is available in four- or eight-port models with or without an internal 9.6K bit/sec. modem. The composite link can run up to 19.2K bit/sec., and the aggregate input is 76.8K bit/sec.
Price: $1,500 - $2,900.

DCX 825/871
The DCX 825/871 is Paradyne's mid-range multiplexer, which is equipped with an internal 9.6K bit/sec. modem. The 825/871 can accommodate 32 users and an aggregate input of 153.6K bit/sec. The composite link can run up to 19.2K bit/sec. The 825/871's "onward link" option provides the ability to have single or multiple point-to-point lines brought back to a 825/871 and then linked to an 825/871 at the host site.
Price: $3,000 - $8,500.

DCX 840
The DCX 840 represents Paradyne's top-of-the-line multiplexer family. It can accommodate up to 240 users and 15 composite links. These links can have an aggregate input of 353K bit/sec. Paradyne also provides a variety of specialty cards for specific applications.
Price: $8,000 - $100,000

DCX 850
The DCX 850 is the same as the DCX 840 but with the added feature of the user switching option. This option provides port contention, queuing, user switching, automatic rerouting and automatic load balancing.
Price: $8,000 - $100,000

DCX 861
The DCX 861 is a low-end four- or eight-port statistical multiplexer with a built-in 9.6K bit/sec. modem. It is compatible with an analysis multiplexer control option, which is part of the analysis network management control system. The DCX 861 has an aggregate input of 38.4K bit/sec.

Timeplex, Inc.
(201) 391-1111

Microplexer Series III
The Timeplex Microplexer Series III statistical multiplexer features statistical multiplexing of asynchronous and synchronous data, support for one to four data links with up to 48 input/output ports, traffic-balance capability with dual- or quad-link models and multiexchange bypass capability.
Price: $2,300 - $4,630

DTM48
The DTM48 is a transparent time-division multiplexer (TDM) and statistical multiplexer combined into one unit. It provides port speeds of up to 38.4K bit/sec. for synchronous TDM and 9.6K bit/sec. asynchronous/synchronous for the statistical multiplexer. It supports speeds of up to 64K bit/sec. data link with a "hot" standby data link. It provides combined TDM and statistical multiplexing of up to 44 ports of synchronous or asynchronous data for point-to-point transmission over a wideband data link.
Price: $5,880 - $6,600

Networking Microplexer
The Networking Microplexer offers a choice of two standard series with 96 or 144 ports and six data links; integral switching and port contention, compatible with the Switching Microplexer product line; fault-tolerant system design; automatic alternate routing; traffic-balancing capability; six data link rates of up to 19.2K bit/sec. standard; and statistical multiplexing of both asynchronous and synchronous data.
Price: $13,050 - $19,900

Quad Switching Multiplexer
The Quad Switching Microplexer unit combines switching with statistical multiplexing and can connect more than 240 ports either locally or at multiple separate locations using high-speed data links. Remote hubbing and traffic-balancing features permit a variety of configurations. The unit offers switching and contention with four user-definable port types; selecting, contending, contention and dedication; four data links for flexible network configurations; data link rates of up to 19.2K bit/sec. per data link; traffic balancing capability; and automatic alternate routing.
Price: $4,300

Switching Microplexer
The Switching Microplexer offers integral switching and contention with four user-definable port types: selecting, contending, contention and dedication. It has automatic alternate routing, two data links for flexible network configurations, data link rates up to 19.2K bit/sec. and statistical multiplexing of asynchronous and synchronous data. It is Quad Switching Microplexer compatible.
Price: $2,800 - $4,210

Research assistance provided by Datapro of Delran, N.J.

Timeplex®

Timeplex, Inc. Woodcliff Lake, NJ 07675 201-930-4600

DIAL-INQ READER SERVICE NUMBER 58

SYSTEMS & PERIPHERALS

HARD TALK

James Connolly

The myth of the MIPS

The usefulness of processor price/performance numbers tossed about by computer vendors and the trade press is overrated, according to a theory offered by the Wall Street investment firm of Sanford C. Bernstein & Co.

A study by Bernstein analyst Mark D. Stahlman raises interesting points and tries to answer the 40-year-old question of which computer is right for which customer.

Stahlman seems to hit the mark with his statement that most users don't make decisions based on ratings such as million instructions per second (MIPS), and that such performance numbers don't make a vendor successful, particularly in maturing segments of the computer market. Even the use of MIPS as a measure of relative performance is flawed by the widening gap between the values MIPS assigns to IBM systems and Digital Equipment Corp. systems. Stahlman says 1.0 IBM MIPS equals 1.9 to 2.1 DEC VAX MIPS, on an average.

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Masstor overcomes IBM threat

BY ALAN ALPER
CW STAFF

NEW YORK — In early 1985, IBM told its customers it would not support a mass-storage system — called the 3850 — on future generations of mainframes. That decision, many observers felt, would be the death knell for Masstor Systems Corp., a struggling Santa Clara, Calif.-based maker of compatible mass-storage systems.

Yet, three years later — after four consecutive years of losses totaling $38.5 million —Masstor is surviving. Indeed, the 11-year-old firm has strung together three consecutive profitable quarters and says it expects to finish fiscal 1987 in the black.

The maverick firm still markets a mass-storage system that uses video recording techniques to store a minimum of 55G bytes on tightly wound cartridges that are kept in honeycombed modules. The M860 features robotic arms that automatically load and unload cartridges.

Today, Masstor appeals to IBM users' efforts to reduce costs and save precious data center floor space. Masstor is emphasizing data storage management that advocates migrating less-active data from costly direct-access storage devices (DASD) to its mass storage system. The firm is also playing up the faster access times and higher reliability of its approach vs. conventional nine-track, reel-to-reel tape drives and IBM's 3480 cartridge tape drives.

IBM, which withdrew the 3850 last year, has advised customers to replace the mass-storage system with additional 3380s. The strategy, which IBM hopes will provide it with a revenue jolt, is not only expensive for users but consumes precious floor space in the cramped quarters of their data centers.

One dedicated Masstor customer, National Westminster Bank USA — a bank with $10

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Data View

Top 10

IBM 3090 Model 200 leads competition in U.S. general-purpose installations

Rank	Manufacturer and System	Total Purchase Price (millions)	Installed Systems
1	IBM 3090-200	$6,350.4	882
2	IBM 4381	4,573.3	4,971
3	IBM System/36	4,404.5	62,922
4	IBM 3081	3,345.3	1,593
5	IBM 3084	2,961.2	673
6	DEC VAX 11/780, 11/782, 11/785	2,810.4	17,565
7	IBM System/38	2,587.4	10,781
8	DEC VAX 8600, 8650	2,070.0	3,450
9	Unisys Corp. 1100/90	1,836.8	328
10	IBM 3083	1,719.3	1,563

INFORMATION PROVIDED BY COMPUTER INTELLIGENCE
CW CHART

Service in demand

BY STANLEY GIBSON
CW STAFF

MOUNTAIN VIEW, Calif. — More and more users want their systems available all the time and expect to pay less for this capability. That is one of the conclusions reached in a report on large-systems service released recently by Input, a research firm here.

Users have observed that hardware is becoming increasingly reliable and have pressured vendors to reduce hardware maintenance prices to reflect the reduced costs of servicing these systems, the report says.

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Wyse touts multiuse terminal

BY JAMES CONNOLLY
CW STAFF

SAN JOSE, Calif. — Wyse Technology has announced a terminal designed to feature ASCII, personal computer, American National Standards Institute (ANSI) and Digital Equipment Corp. compatibility and graphics in a single product.

The Wyse WY-99GT, which is list priced at $649, has multiple keyboard options that allow a user to work in ANSI DEC VT220, multiuser personal computer and ASCII terminal environments. The terminal also features a dedicated graphics coprocessor for compatibility with popular graphics standards such as those of the Tektronix, Inc. 4010 and 4014 terminals.

Wyse claimed price and functionality advantages in comparison with competing vendors. For example, the company said the WY-99GT supports text and high-resolution graphics at a lower price than DEC's text-only VT220.

Inside

Service

CONTINUED FROM PAGE 55

Recently, IBM offered users discounts and free seven-day-a-week, 24-hour service in exchange for the users taking over some maintenance duties through the Corporate Service Amendment to the IBM Maintenance Agreement.

The study reports that average user requirements for system availability have risen from 96.7% in 1983 to 98% in 1986 and will likely exceed 99% within the next five years.

"Large users are realistically demanding 100% availability," said Rick Brusuelas, manager of the customer service program at Input. "There is only so much you can do by sending a field engineer faster," he added, explaining that, in the past, manufacturers relied on better manufacturing methods and faster response by field engineers to provide better service.

But response and repair times have reached the limit of diminished returns, he pointed out, particularly in large systems, in which response times average 1.2 hours and repair times average 2.7 hours.

Future progress in hardware service will come only by increased use of redundant systems. In addition, remote support must include actual fixes, not merely diagnostics as it currently does. Also, the service organization will need to use artificial intelligence and expert systems to aid onsite and remote support personnel in diagnostics and problem resolution, the company concluded.

However, these advances will not bring significant revenue growth in hardware service. To attract more business, Input advised, service companies should pursue nonhardware maintenance, such as software support.

While the researchers projected that hardware service revenue will grow only slightly during the next four years, software support revenue is expected to rise 24% per year. Input found that users would be willing to pay more for software support if it would improve their productivity. The Input report also predicts professional services such as network planning and consulting will grow 23% annually.

DEC option vendor links VAXBI, VME

ALBUQUERQUE, N.M. — Aeon Systems, Inc. is now shipping its VAX Bus Interconnect-to-VME adapter, known as Viva, which is an intelligent interface that connects Digital Equipment Corp. VAXBI-based machines to the VMEbus.

Viva, the first in a series of seven planned DEC option products, consists of a VAXBI board and two VME boards, according to Aeon.

The bus converter, designed for the aerospace industry, provides simulation and real-time data requirements to be serviced through the VME instrumentation bus directly to the VAXBI, the vendor claimed.

Designed for high-speed, direct memory access transfers, Viva reportedly provides a data link in excess of 5M byte/sec. within a 50-ft radius using accepted interface standards.

The interface includes a full-duplex RS-422 interconnect at up to 10M byte/sec., two direct memory access channels with 8K bytes of first-in, first-out memory in each direction, a J11 microprocessor on the VAXBI port, a Motorola, Inc. 68020 microprocessor on the VME side and full handshaking to eliminate buffer overrun, the vendor said.

Viva lists at $15,000 and is available from Aeon 60 days after receipt of order.

The Albuquerque-based firm is a DEC-licensed option vendor and a wholly owned subsidiary of Aquila Technologies Group, Inc.

NEC, Imagen ink product deal

BOXBORO, Mass. — NEC Information Systems, Inc. recently signed a five-year, $2 million agreement with Santa Clara, Calif.-based Imagen Corp. to purchase that firm's IP/II image processors and its Impress page-description language.

The Imagen products will be integrated with NEC's Unix-based Astra XL/32 multiuser minicomputers and EWS-E advanced engineering workstations, according to NEC Information Systems. Users can link the systems to 30 page/min, 300 dot/in. laser printers, the vendor said.

Imagen's IP/II image processor is an intelligent subsystem that reportedly can enhance the performance of nonimpact printing devices.

The processor off-loads the host computer of the print control function, managing resident document-processing software, typefaces, graphic arts fonts and communications interfaces, NEC claimed.

The image processor is based on three Motorola, Inc. 68000 microprocessors and Imagen's proprietary real-time Rasterization technology.

This configuration enables true throughput at the printer's rated speed, according to a NEC Information Systems statement.

Myth of MIPS

CONTINUED FROM PAGE 55

According to Stahlman, price/performance is a critical ingredient for fueling growth in new markets where a product fits in well with a large class of unaddressed applications. But claims of price/performance advantages won't help personal computer vendors steal large numbers of customers from mainframe vendors, he says. Even proven vendors can't rely on price/performance advantages to carry them, he adds, citing the case of Data General Corp.

"Data General has experienced an erosion of OEM support while its revenue growth lags [behind] that of the minicomputer market in spite of impressive benchmark statistics. For that matter, dozens of smaller competitors routinely attempt to gain market share with performance-based product positioning.

"While products that can deliver 50% to 70% better price/performance (relative to DEC and IBM) undoubtedly open some doors, the evidence is overwhelming that performance alone cannot produce sustained market-share gains," Stahlman says.

Looking at life-cycle costs

So, what does the user in an established market want? Stahlman points to computer industry advertising slogans that boast of solutions and total fit of a new product. He says users look at life-cycle costs and the ability to accomplish useful work based on throughput under actual work loads. Stahlman says dependence on measures such as MIPS "ignores the overriding significance of software at both the applications and systems levels."

Performance numbers are useful when they are based on actual benchmarks, according to Stahlman, who cites the public-domain Dhrystone and Argonne National Laboratory's Linpack as the best tests now available.

Stahlman's report provides valuable insight into the strengths of various benchmarks and the failings of industry observers who rely too heavily on measures such as MIPS.

But a couple of relatively minor points should be added in defense of those who refer to MIPS, including *Computerworld.*

Who releases MIPS ratings?

First, Stahlman gives the impression that vendors release MIPS ratings only at the insistence of the trade press. It is true that some vendors, IBM included, won't publicly discuss MIPS at all, and some companies will do no more than confirm that MIPS estimates are in the ballpark for their systems.

But many other vendors tout their own MIPS ratings or are all too ready to provide ratings when asked. The latter companies usually answer the media's request with something like, "Well, we don't believe that MIPS is a good measure of a system's performance, but since you asked, we think it will do X MIPS, which is twice what our competition offers."

In addition, whether they should be doing so or not, many MIS organizations still look for a single performance number that they can attach to budget proposals or requests for bids. Those users, often bound by corporate rules or government policies of which they have no control, still count on MIPS ratings because, quite simply, nothing better has come along. Stahlman is right in saying that live benchmarks such as the Dhrystone are more accurate. Unfortunately, those results are seldom publicly available when a system is announced.

What both the computer industry and the MIS manager need is agreement among the vendors on a couple of benchmarks that can be run before a system is delivered to users — with any luck at all it would be before the system is introduced. The ideal would be to have a test that would measure the overall system throughput of heavy transaction loads on a commercial DP system and another measuring the raw CPU performance that seems so popular among technical users such as engineers and scientists.

People like Stahlman who hammer home the need for realistic benchmarks as well as the value of supporting software are providing a service to the industry as well as to the user community.

Connolly is *Computerworld*'s senior editor, systems & peripherals.

IPL designs System/36 memory cards

WALTHAM, Mass. — IPL Systems, Inc. continued its string of IBM-compatible memory announcements recently with the introduction of 2M- and 1M-byte memory cards for the IBM System/36.

The offering of the add-in memory cards comes in the wake of recent IPL introductions of memories for IBM mainframes and System/38 minicomputers.

The new cards were designed for use in System/36 Model D processors. IPL claimed a price advantage of 67% in comparison with IBM memory boards.

IPL, which also manufactures systems compatible with IBM 4300 mid-range units, said its 2M-byte cards cost $4,200 and the 1M-byte cards cost $2,625.

Masstor

CONTINUED FROM PAGE 55

billion in assets — refuses to bring in additional DASDs. The U.S. subsidiary of National Westminster Bank PLC of the UK — which, for the last year, has been using one M860 with 55G bytes of storage for programmers creating test environments — will bring in another unit this year, notes Harry DeHaven, vice-president of data center operations and technology management.

The new M860 will handle production data as part of the bank's effort to provide more efficient data storage management. National Westminster's parent recently signed an add-on contract, potentially worth $7.3 million, to use additional Masstor M860s and services.

"We look at the M860 as an interim step between archiving on more expensive DASD or on less expensive tape in a shorter period of time," DeHaven says.

Could save $2 million

More importantly, the bank figures it will save $2 million in its 1990 capital budget for disk and associated products if it installs the M860 this year rather than bringing in additional 3380s.

"The rationale was that if we can hold DASD growth to 30%, rather than the 40% to 45% that is the industry average, we'd save a lot of money," DeHaven explains.

Other Masstor users seem drawn to the M860's automated cartridge-handling system as an alternative to the inefficiency and expense of manual tape mounts. Even the IBM 3480 with a chute-type loader feeding up to six cartridges does little to cut tape-mount time and cost, users say.

Part of the problem is that data centers rarely use more than 10% of the capacity of the tapes in their libraries.

"People don't fill up the tape since it's faster and cheaper to get another tape," says Michael Beadsmoore, senior vice-president of marketing and systems development at Masstor. "People rarely put more than one data set on a tape."

One data center manager, who is a large Masstor customer and who requested anonymity, brought in the M860 three years ago to reduce tape mounts and, ultimately, data center expenses.

In 1983, the firm mounted 800,000 tapes. The firm projected that unless it found a way to automate the process, it would mount 1.2 million tapes this year.

This data center manager says that in the three years his company has used the M860, tape mounts per year have increased to 850,000. "We've probably saved about $2 million a year because of it," he points out.

Yet other users are suspending judgment on the cost savings of the M860 pending the release later this year of Storage Technology Corp.'s 3480-compatible tape drive with its automated tape handling and library storage modules.

One Masstor user says he is considering the Storage Technology 4400 automated tape library with its 3480-compatible tape drives. "STC is providing 20 times the storage in the unit that Masstor has," he notes. "That in itself is worth considering."

'Up against the wall'

Masstor, the user says, is "up against the wall" because it has not been able to reduce the cost of its product. "With the STC product and optical coming, it's going to be tough for them," he adds.

Masstor's Beadsmoore says he is not worried about Storage Technology's 4400. "There's no way it can handle 163 mounts an hour as claimed," he says.

Concerning optical, Beadsmoore says Masstor's video recording techniques will eventually offer greater densities and higher reliability.

Meanwhile, some users — particularly those in government and the insurance industry — have remained loyal to the concept of mass storage. In fact, some IBM 3850 users — such as Nynex Corp. — have shifted to the M860 because of their commitment to the technology.

Beadsmoore says the withdrawal of the 3850 has created opportunities for his firm. In a recent bid, IBM proposed to replace three 3850s with disk and tape drives totaling $18 million. "Our solution cost less than $6 million," he recalls. "There were huge economic pressures that helped make the decision in our favor."

The Masstor unit costs $550,000 in its most basic version.

Nynex, which had used 3850s for a number of years, replaced the IBM units with Masstor products in April 1986. "We got rid of the 3850s because they were not reliable and were slow," recalls Trentolm Turner, senior systems analyst at a Nynex data center in Boston.

The company now has two M860s with 55G bytes of storage each and has not experienced any problems. "We're not getting any calls in the middle of the night like we were before," Turner jests.

Like other Masstor customers, Turner says Nynex is not concerned about the future of mass-storage technology or its vendor's viability. "We're willing to live with the risk," he says. "We've not had problems and will buy add-ons as we need them."

Despite IBM's withdrawal from the market, M860 users are not worried that IBM will not support the product in the future. "With the software we have, the M860 looks like two tape drives to our system," National Westminster's DeHaven notes. "There's no question that IBM will continue to support nine-track tape drives."

NEW PRODUCTS

Turnkey systems

Data Professionals, Inc. has announced its **Messenger/Delivery Management** multiuser and multisite computer system.

The system is said to feature integrated order entry, billing and dispatch; accounts receivable; remote location access, accounts payable and general ledger; personnel management; productivity report; and management analysis.

Base price for the fully integated local-area network system, including a Novell, Inc. 286 file server with two 85M-byte hard drives and tape backup, Novell Advanced 286 Netware and the Messenger/Delivery Management software, is $25,000.

The price per workstation is $1,400 plus cabling and printer, the vendor said.

Data Professionals, P.O. Box 4356, Seattle, Wash. 98104.

Processors

Bicc-Vero Electronics, Inc. has announced the **VME48201** four-channel serial communications controller for the VMEbus.

The board includes a daughterboard and an RS-232 personality module. Features include 8K bytes of erasable programmable read-only memory and 8K bytes of dual-ported random-access memory (RAM).

The VME48201 is priced at $595. With 32K bytes of RAM, the controller costs $695.

Bicc-Vero Electronics, 1000 Sherma Ave., Hamden, Conn. 06514.

Heurikon Corp. has introduced its **HK68/VE** microcomputer for the VMEbus.

The HK68/VE is said to offer the 10- or 12.5-MHz Motorola, Inc. 68000, up to 1M byte of onboard dynamic random-access memory with parity, up to 256K bytes of erasable programmable read-only memory, two RS-232 serial ports, a single 8/16 ISBX connector, mailbox-interrupt support and full interface to the VMEbus with system-controller functions.

The HK68/VE is priced from $895.

Heurikon, 3201 Latham Drive, Madison, Wis. 53713.

CAD/CAM/CAE

General Electric Co.'s Calma Co. has announced the **Project Review Terminal**, which is said to allow designers to walk through three-dimensional computer models in real-time.

The terminal is said to allow users to display conceptual alternatives, construction-ready designs or existing facilities. It performs shading and hidden-line removal, 3-D rotations, Z-clipping and local pan, zoom and rotation.

The Project Review Terminal is available for use with Calma's Digital Equipment Corp. Microvax II-based Dimension III systems. It consists of a 19-in. color monitor, alphanumeric display, keyboard, tablet and Graphicon controller.

The Project Review Terminal carries a price tag that starts at $50,000.

Calma, 2901 Tasman Drive, Santa Clara, Calif. 95050.

Graphics systems

Greyhawk Systems, Inc. has announced a line of paperless plotters including the **Softplot 2222** color plotter and the **Softplot 1222** monochrome plotter.

The plotters feature either raster-imaging or vector-plotting capabilities in a single machine. According to the vendor, document annotation is accomplished in real-time.

Softplot 2222 produces a 1,024- by 1,024-pixel raster display in 30 seconds or a full-color D-size raster display in up to 180 seconds with 120 million addressable points and a resolution of 400 dot/in. Pan and zoom features are standard.

Pricing for the Softplot series ranges from $30,000 to $50,000.

Greyhawk Systems, 1557 Centre Pointe Drive, Milpitas, Calif. 95035.

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Data storage

System Industries, Inc. has announced the **Quick Disconnect System** for its Digital Equipment Corp.-compatible disk drives.

The Quick Disconnect System is said to allow small form-factor disk drives to be removed from enclosures. Formatted capacities of removable System Industries drive modules range from 320M bytes in the 5¼-in. package to 522M bytes in the 8-in. form. When removed from a Quick Disconnect enclosure chassis, each drive module is interchangeable among all System Industries Quick Disconnect chassis of corresponding size.

Prices vary depending upon configuration. A two-drive 5¼-in. Quick Disconnect System in a 19-in. rack is priced from $16,900 to $19,400.

System Industries, 560 Cottonwood Drive, Milpitas, Calif. 95035.

Terminals

Recognition Equipment, Inc. has introduced an RS-422 interface package for its **Tartan XP** series of expanded processors.

The Tartan XP series consists of three systems that allow up to 32 operators to share additional processing power, disk storage and expandability.

The RS-422 interface is said to allow any of the terminals on a connected bus to access the Tartan XP system without the need for multiple cables connecting the processor and terminals.

The RS-422 interface package, including two Tartan processors, two processor-to-terminal cables and two local-area network interface units, is priced from $4,995.

Recognition Equipment, P.O. Box 660204, Dallas, Texas 75266.

Printers/Plotters

Micro Trends Corp. has announced that its **Model 92160** dual-purpose IBM twinaxial/coaxial printer controller is now available for the IBM System/34, 36 and 38 and mainframe plug-compatible computers.

The Model 92160 is said to emulate the IBM Model 5256, 5225, 4214 and 5219 twinaxial printers as well as the Model 3287 and 3262 coaxial printers. It offers a print throughput speed of 60 page/min. According to the vendor, it allows true plug-compatible operation and does not rely on an outboard box-type protocol converter.

The Model 92160 is priced at $1,150.

Micro Trends, 5709 Three Notch Road, Mobile, Ala. 36619.

Power supplies

Lowell Corp. has announced the **Emerson UPS1500**, a power-protection system for networks, supermicrocomputers, microcomputers and graphics applications.

The Emerson UPS5100 is said to provide from 20 to 40 min of backup power. It protects against all power line fluctuations and provides 1,500W of 120V, 60Hz full sine wave AC power. It features an audible utility power failure alarm and has a front-panel LED operation status display.

The unit comes with four grounded plug receptacles for output power.

The Emerson UPS1500 is priced at $1,499.

Lowell, P.O. Box 158, 97 Temple St., Worcester, Mass. 01613.

Shape Magnetronics, Inc. has introduced a portable plug-in **Computer Line Tamer** power conditioner.

The 2,500V ampere power conditioner is said to remove noise and voltage spikes and compensate for brown outs and overvoltages. It was designed for use with computers, peripherals and microcircuit-based systems ranging from private automatic branch exchange terminals to typesetters to photographic equipment.

The portable, plug-in 2,500V ampere Computer Line Tamer is priced at $717.

Shape Magnetronics, 901 DuPage Ave., Lombard, Ill. 60148.

Input devices

Data General Corp. has announced the **Model 5244BC** bar-code terminal, which is said to incorporate the functionality of the vendor's Dasher D215 line of display terminals with an integral bar-code wand.

The terminal also features a bar-code selection menu. An auxiliary printer interface provides local or pass-through operation.

The bar-code terminal supports asynchronous, full-duplex communications and is compatible with RS-232 and RS-422 communications devices.

The Model 5244BC is priced at $1,595.

Data General, Rt. 9, Southboro, Mass. 01772.

Barcode Industries, Inc. has introduced the **Minibar**, a bar-code reader said to interface as a wedge to more than 50 terminals and personal computers.

Data from the reader is sent to the display in keyboard-emulation format. The Minibar is said to be able to transmit data in RS-232 format to cash registers, computers and terminals.

The Minibar supports input from magnetic stripe readers, hand-held laser diode scanners and RS-232 devices.

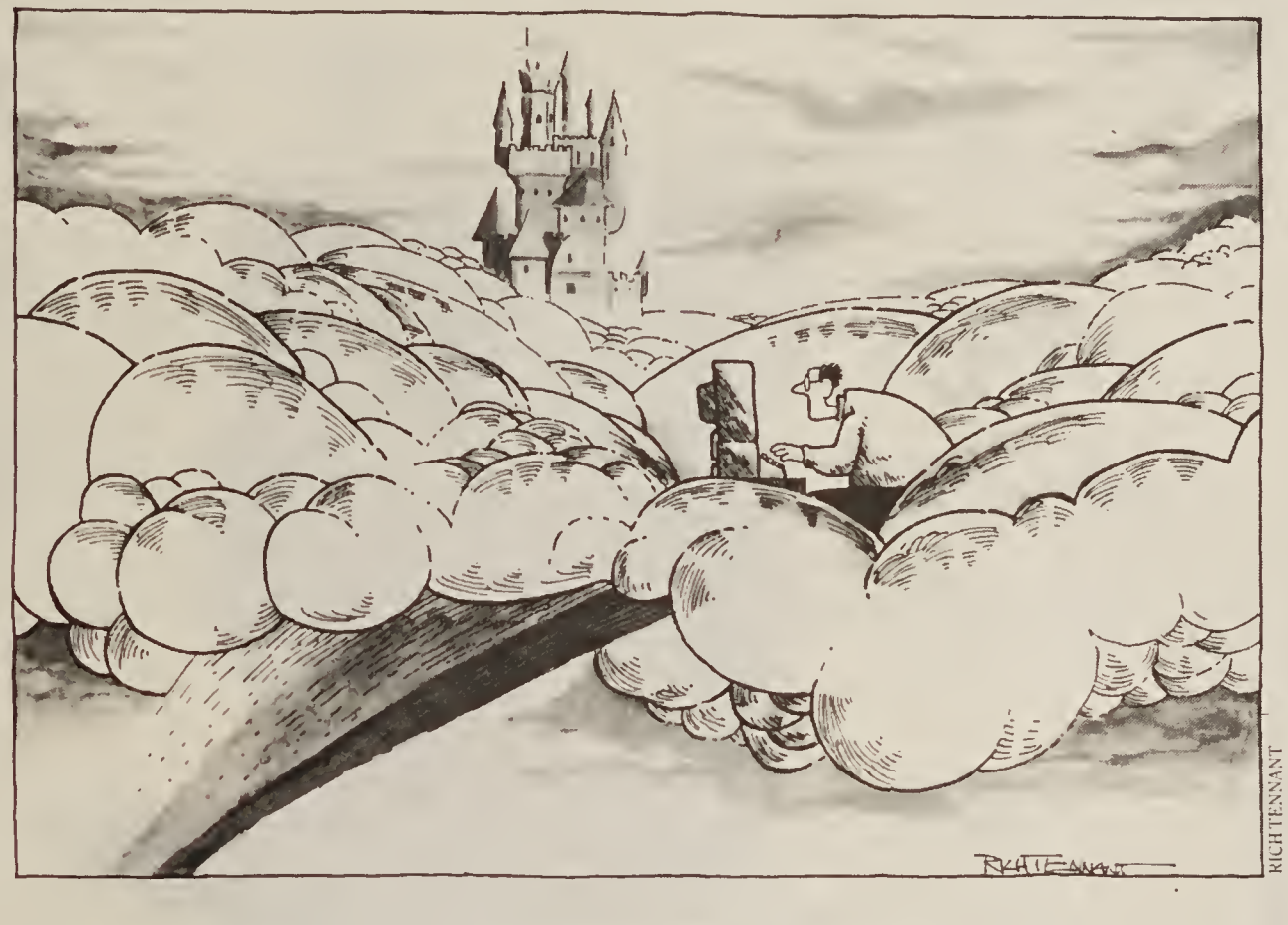
The Minibar is priced at $465.

Barcode Industries, 17 Barstow Road, Great Neck, N.Y. 11021.

Over the rainbow in a software garage shop

Your programmers may thrive on pure thought, not rigorous control

BY WILLIAM HARRISON



RICH TENNANT

The original programmers came from everywhere — they were mathematicians, teachers, English majors, physicists and others from a variety of professions. No general criteria existed for their selection: The selection process came down to, "Find someone who likes to program, and we'll see if they are any good at it." So began the software profession.

While professions like mechanical engineering and architecture evolved over hundreds, if not thousands, of years, software engineering was pressured to mature into a profession in less than a decade. The culture, methodologies and management strategies would, it was assumed, materialize overnight.

Recent articles and papers attempt to formulate engineering methodologies in hopes of enhancing software engineering productivity and professionalism. Productivity gains were in fact realized in the 1970s when new methodologies were introduced, but further gains are elusive. This article proposes that gains in software engineering productivity can be achieved, not by new engineering methodologies but through the development of a professional environment.

My first encounter with programming was on the RCA Corp. Bizmac, a large vacuum-tube computer of the 1940-to-1950 era. Programming on the Bizmac consisted of writing down numbers that represented the instruction operation codes and necessary memory addresses — a tedious process at best. Toward the end of the Bizmac era, RCA introduced a symbolic assembler called Easycoder. It was a much-welcomed software engineering methodology.

In the 1950s, few programmers or engineering managers possessed a solid hardware background. Management's view was that programming would never develop into a profession — certainly not an engineering profession. Another widely held belief was that universities would never offer a degree in a subject such as programming.

Programming departments seemed to grow like weeds. Hardware engineers did not have time to write test programs, so someone who had a knack for it was given the assignment. Tasks that initially were thought to take a week soon required man-years, and departments formed around those tasks. The size of software projects continued to grow, with predictable results. Most managers lived in fear that the software project would never end and, if it did end, might not do what it was expected to do.

The chaos ended when new software engineering methodologies, such as structured design, were introduced and rigorous controls were imposed, enforcing the methodologies' implementation. Projects were brought under control, and, within reason, the software functioned in the prescribed manner. But the combination of methodologies and rigorous controls appears successful only in comparison with the disorder that existed prior to its implementation. When compared with the productivity that is ideally possible, these methodologies may be a very expensive approach.

Pure thought

A true science of software engineering can never be formulated with engineering methodologies alone. Software development is almost a pure thought process and is better understood from a psychological and humanistic viewpoint.

Except for the final product, the software development process will produce a series of abstract and intangible components that, to developers, are

Harrison is an engineering manager with Siemens Information Systems in Boca Raton, Fla.

- **Software engineering in human terms**
- **Overcontrol: a license to stop thinking**
- **When will a true software science arise?**

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are almost living entities but appear to those outside of the process as a series of cryptic notations. Even design reviews do not penetrate the depths of these entities. Only the minds of the developers understand them.

Because software development is an almost pure thought process, further gains in development productivity will not be achieved by rigorous process control or complex methodologies. Management overcontrol and methodologies can lead to boredom and a general slowdown of the thought process.

Success stories

A phenomenon of the past decade is the "software garage shop." Successful software garage shops appear to produce large software programs at very low cost and above-average reliability. In most cases, these shops rely little on current engineering methodologies. Many large companies such as Microsoft Corp. and Apple Computer, Inc. started in the 1970s and '80s as garage shops.

> CONTROLS and methodology carried to the extreme are essentially a license to stop thinking.

A software garage shop is made up of a small number of highly skilled programmers, each of whom is given a high level of responsibility. These programmers communicate well with each other. They enjoy working together and like what they are doing.

The shop environment is such that problems can be resolved quickly. For instance, if a personal computer or piece of test equipment is needed, it can be procured without delay. Requirements problems are resolved, usually by talking with the company president.

The only rules followed are unwritten and abstract, such as the following:

- Everyone must be treated — and must behave — like a professional.
- Everyone must be committed to the objective.
- Common sense must prevail.

A reasonable question is, What is meant by the expression "professional engineer?" The word "professional" implies the person can be expected to behave in certain ways. Assumably, he will display a high level of responsibility. The hiring manager's confidence that a person will behave in a professional manner is usually based on that person's education and experience.

All professions exhibit some controls, but the level of control imposed on a large software project's team in many cases resembles the level imposed on unskilled labor in a manufacturing environment. Many projects control a software engineer's activity to the level of micromodules and micromilestones — not a motivating action.

This level of control can be seen as a backlash to the earlier disasters caused by the anarchy of early software engineering. Many software departments give new programmers a copy of the software design handbook or standards manual and say, "There will be no deviations from this manual." What they are really saying is that the engineers are not required to think about the design problem.

Controls and methodology carried to the extreme are essentially a license to stop thinking: Programmers do not have to be concerned because "the system will take care of the problems."

A software standards manual should be a living document, updated continuously by a department's software engineers. Its contents should recognize that software engineers are capable of knowing when standards should be applied in force and when they are not applicable.

The elapsed time required to complete a project varies with the level of control applied (see chart page 69). Too few controls produce an undisciplined environment in which it is impossible to make progress. Too many controls, however, require a large investment in time and

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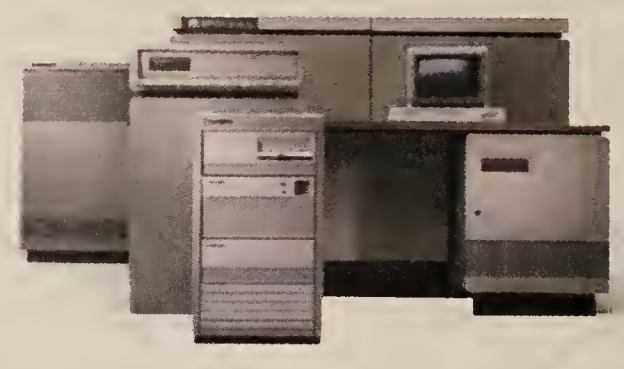

HP 3000 family. Micro 3000 XE, Series 52, 58, 70, 930 and, not shown, Micro 3000 and Series 950.

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Susan Kennedy should know. She's a product analyst at Leasametric, a company that rents, sells, and services DP equipment all over the country. Including thousands of terminals. And since reliability is crucial to Leasametric, they tear each evaluation unit apart piece by piece. Then, they give it a series of tests that make MIT exams look easy.

"Too many terminals just don't measure up," says Susan. "I've seen machines with questionable ergonomics...keyboards that flex in the middle when you type... even cheap little diodes that could drop off.

"But TeleVideo starts with solid engineering, and follows through with every detail. Overall, they've built the same quality into the 9220 that's made all their other terminals last so long."

And there's more to the 9220 than quality and reliability. There's also an extended feature set, including full VT-220 compatibility. A super-dark 14" amber screen. A tilt and swivel base. 30 programmable function keys. Plus the best thought-out ergonomics around. All for exactly $619.

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manpower in the controls process and reduce motivation. The shortest possible development time results from an ideal level of controls — a level found only in a professional development environment.

Priority of needs

Some insights into the problem can be gained by comparing, from a psychological point of view, the environment in a highly structured and controlled department with the environment in a software garage shop. Consider behavioral psychologist Abraham Maslow's theory on need, which states that a human's needs are hierarchical in nature; from the lowest point, they are as follows:

- Physiological needs — the need for basics such as shelter, food and warmth.
- Safety needs — the need to eliminate threats and danger.
- Social needs — the need to belong and fit into a group.
- Ego needs — the need for self-respect, self-confidence, self-esteem, status, autonomy, recognition and appreciation.
- Self-fulfillment needs — the need to realize one's potential.

In general, the needs at the low end of the hierarchy are given priority, and the needs at the upper end are inoperative until the lower needs are satisfied. Ego considerations are not important to a man who has not had a drink of water in three days. Once he drinks all the water he needs, ego needs may become important.

A highly structured department is effective at fulfilling the lower physiological and safety needs: Structured departments are almost always part of a large company, which in most cases offers greater financial security. By contrast, in a software garage shop the threat of the business's failing hovers constantly. However, the garage shop is better at fulfilling higher needs — self-fulfillment, ego and social — which lead to high productivity.

The two development environments offer differing fulfillment levels of the various needs:

Self-fulfillment. A characteristic of the most productive software engineers is that they are always working toward self-fulfillment. The software garage shop is fulfilling because it lets creativity soar. The engineers do not feel bound by regulations. They believe that all ideas are worth considering and that management will respond positively to them.

Structured departments, on the other hand, by definition almost close off new ideas. There is no way to handle new ideas; they do not fit into the existing structure.

Ego. In a software garage shop, instant recognition is given to anyone who does anything to help the project or the company. Rewards come quickly in the form of money, lunches and praise.

In a structured department, software engineers in many cases do not try to get recognized for an accomplishment, believing management, through a lack of understanding or because of problems in the structure of the department, may compromise or even eliminate the accomplishment. In some cases, managers may take more than their fair share of credit.

Social. The software garage shop staff's small size is ideal for filling social needs. This staff is a tightly knit team that knows how to work and play together.

People in a structured department tend to band together in small groups of two or three people. These groups tend to defend themselves from both management and other employees. In most cases, when a new software engineer joins a large structured department, he feels that his social acceptance is equivalent to that of the new kid at school.

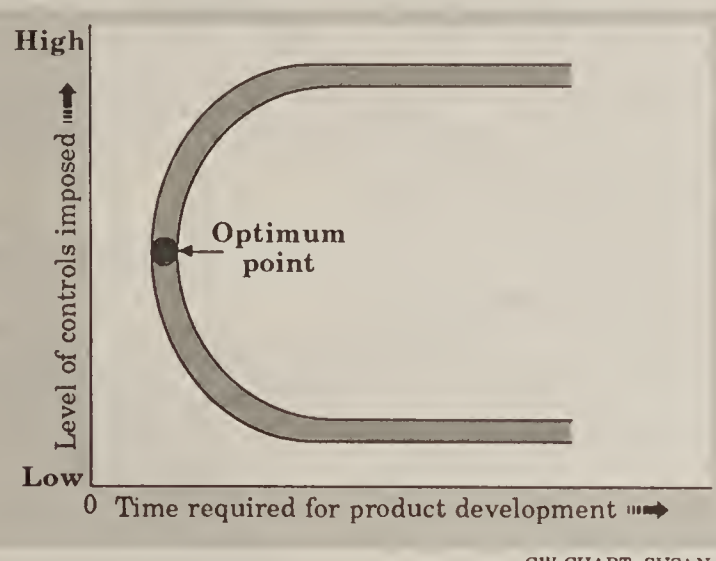
Safety. A garage shop provides safety at a high level on Maslow's hierarchy but not at a low one. Software engineers in a garage shop never feel threatened personally; that is, they believe they will always be treated fairly and that their integrity will be safeguarded. However, they are threatened by the fact that the garage shop is frequently on the brink of financial disaster.

The structured department is good at fulfilling basic safety needs, since it is usually part of a large, well-financed company. Because of the unusual social structure of a large department, though, an individual's personal integrity can be unfairly threatened. For example, Group A might claim their software component is late because the design of software component B, which they must interface with, is too exotic.

Physiological. In many cases, the small garage shop cannot afford extras like a cafeteria and adequate air conditioning. These things affect productivity. On the other hand, larger

Optimum level of control

In a development cycle, too many controls on developers can be as disastrous as too few controls in terms of meeting deadlines.



CW CHART: SUSAN ALDAM

companies usually possess ample funds for items such as these.

Not too many years ago, the U.S. government asked Lockheed Corp. to build an advanced airplane for reconnaissance purposes. The airplane had to be capable of flying very high, and it had to be built in record time.

Lockheed responded by implementing what it called a "skunk works" team [CW, Jan. 27, 1986], a term from the comic strip, "Li'l Abner." The firm's most talented engineers were gathered together and asked to build the airplane in record time. They were told to use professional judgment in an attempt to bypass traditional levels of paperwork. The engineers in the skunk works teams were successful and gained fame throughout their industry.

The following are some guidelines for building a software skunk works team.

- The team of people selected should be viewed as professionals.
- The team should always run lean. That is, if the project at hand is estimated to require 10 people, then it should be attempted with nine.
- The team should all work in close physical proximity but should be isolated from the main software department.
- The major goals of the project must be stated clearly.

The team should be told that it is responsible for determining which methodologies will be used and what level of control is necessary, although management will retain veto rights. The team can expel a member by majority vote if it believes that member is not carrying his share of the load.

Flexible work hours should be permitted. Each software engineer should attend the necessary meetings. Weekly status meetings should be held; highly motivated people like to talk about what they are doing. The meetings should be as much a social affair as a status check, an open dialog of how things are going, with the general level of participation in the discussions telling management how things are really going.

Management is responsible for tracking and drawing up schedules, but milestone setting

THE TEAM should run lean. If the project at hand is estimated to require 10 people, then it should be attempted with nine.

should be done on a participative basis. Outstanding performance should be rewarded in the form of time off, luncheons, trips and so on.

Management should take the view that all ideas are worth listening to and should establish two basic rules: Everyone must be committed to what they are doing and must behave in a professional way. Quality is expected from everyone.

Think like a manager

Most important of all, the manager of the skunk works team must think like the manager of a small company. He must be demanding in terms of commitment and quality and must convey a sense of urgency and importance about the work that is being done. He must know the management profession and understand people. He must be quick to implement changes when he is convinced that the change is an improvement.

This article does not intend to advocate abandoning work in progress on software engineering methodologies. The point is that professional software engineers are fully capable of determining which methodologies apply and to what extent they should be applied. If 10 man-days have been budgeted to review 10 modules, the software engineer may know that it would be better to spend the entire 10 days on a single module because of its complexity.

The software development process cannot be made into the equivalent of a machine with a crank on its side that is turned when some software is needed. Software development is a profession and must be approached as such if true gains in productivity are to be realized. •

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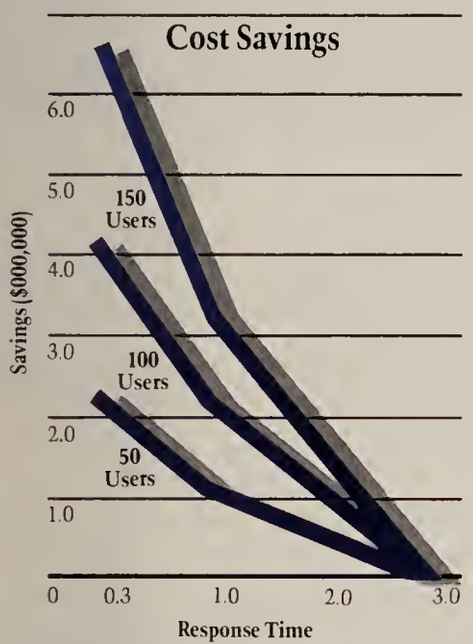

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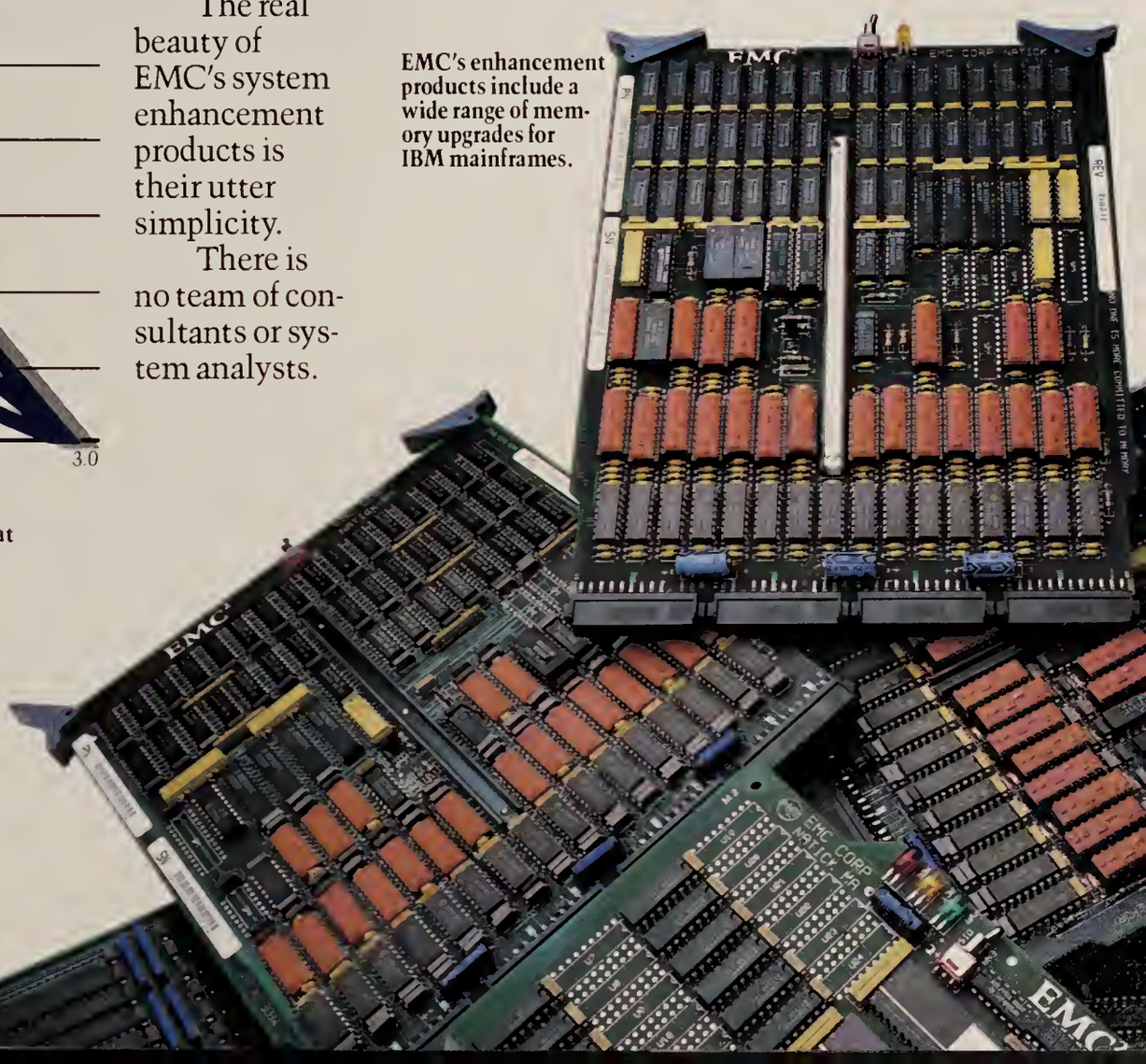

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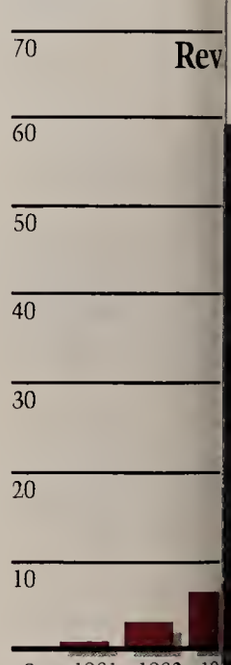

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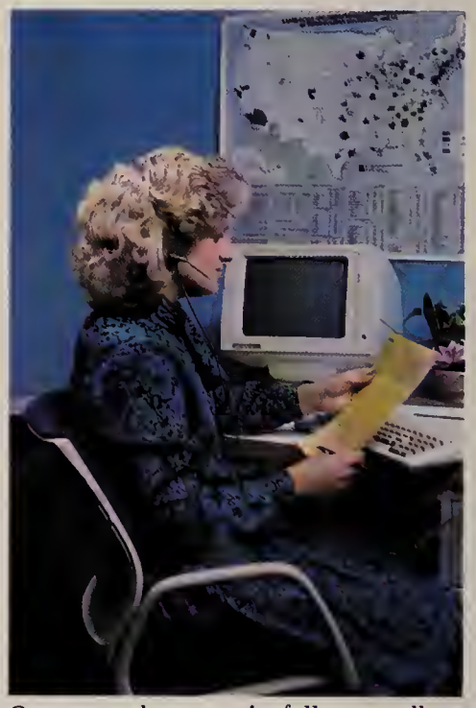

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Big Brother looks inward

"Most MIS managers would rank an EDP audit with a bad case of hives or having a tooth pulled," according to MIS guru Efrem Mallach. But MIS managers in the private sector have it easy compared with those working in the federal government.

The level of scrutiny — criticism, second-guessing and backseat driving — in the federal government is intense. Not only is there the EDP auditing organization, known as the General Accounting Office (GAO), but also the White House Office of Management and Budget, the General Services Administration, contract appeals boards and even the federal courts.

Worse yet, federal MIS managers are faced with the "grand inquisitors" — the oversight committees of the U.S. Congress and the news media. Both of them rely heavily on the GAO audits.

It seems as though the GAO has never seen a DP system it likes, but it would know it if it saw one. GAO reports have titles like: "USDA Needs to Better Manage Field-Office Computer Purchases" and "SBA Needs to Strengthen Management of its Computer Systems." The U.S. Social Security Administration

Continued on page 79

Incentives drive Alamo's MIS

BY JAMES CONNOLLY
CW STAFF

FORT LAUDERDALE, Fla. — An outgoing man with an easy smile and a strong handshake, Thomas S. Loane seems eager to talk about the strategies of his MIS operation as well as his company as a whole.

Loane, executive director of computer and communication services for Alamo Rent A Car, Inc., not only ties those strategies together but presents them as the only logical way to go. As a result, it makes sense to him that MIS employees should be paid bonuses if their systems work and not be paid extra when systems fail.

Loane makes no secret of his pride in Alamo's growth and the expansion of his 46-person MIS shop to support that growth. Alamo has doubled its computing power each year for six years, growing from an IBM System/3 shop to the point of upgrading from an IBM 3090 Model 200 to a 3090 Model 400 later this year.

"We have to be smarter, be faster, be better. We can't outspend our competition. But the converse is that we can out-bureaucrat them. Our company president, Michael Egan, sits 100 feet away from me, and I can walk down there with a half-million-dollar equipment request and get it approved," Loane says.

He emphasizes that Alamo has kept its corporate staff lean, experimented with customer-oriented moves such as simpler car rental contracts, installed leading-edge — though inexpensive — technology such as "throw-away" printers and instituted personnel policies based on performance. "We spend our time implementing rather than writing proposals," Loane says.

The simplicity and commonsense approach that are part of the company's mandate have helped Alamo climb to the No. 5 position in the car rental business after 10 years of active operations, Loane says. "We as a company are very large, but we are also very small. We are trying to grow at 30% a year while keeping the same number of employees in headquarters."

Loane carries out part of the

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UPDATE

Life in the small shop

BY MICHAEL SULLIVAN-TRAINOR
CW STAFF

When a computer salesman visits Parkleigh Pharmacy in Rochester, N.Y., he is ushered to Art Freeman's second-floor office. Freeman is sandwiched between a 10-ft-long desk covered with accounting ledgers and an equally imposing table that serves as a platform for an IBM System/23 Datamaster desktop business computer. It is a natural place for the man who is the store's controller and data processing manager.

"Often, the salesmen don't even realize I'm the controller, and some of them say, 'We can sneak this purchase through. I know it's more expensive, but, heck, you can convince them it's okay.' Then I say, 'Well, I'm

Continued on page 73

Quality group is launched

BY DAVID A. LUDLUM
CW STAFF

The newly formed, nonprofit Society for Information Systems Quality, which plans to hold its first conference next year, has started planning a professional development program that emphasizes personal and business skills.

Leaders of the society, which was was formed in February, say they hope to absorb 13 independent information systems quality assurance organizations in major cities as area chapters, according to society President Anthony Salinger.

Salinger, a manager with AT&T's marketing information systems department, says the society has a goal of attracting 10,000 members in its first year and a half. The society plans to hold its first annual meeting and conference in San Diego next spring, according to Salinger, who has proposed annual membership dues of $50.

The society hopes to attract "the biggest luminaries in the field" as speakers for the conference. "We're shooting for an annual conference that is really going to be a big deal," Salinger says.

In recruiting members, the group is targeting quality assurance specialists as well as those whose work involves quality techniques, such as operations and development managers, consultants and academics.

Its activities are to focus on enhancing the personal success of members and include services such as sending letters that rec-

Continued on page 78

David Blackwell: Info execs can be slow to adopt change

David J. Blackwell, widely known as an information systems innovator, recently retired as executive vice-president and chief administrative officer of Massachusetts Mutual Life Insurance Co. in Springfield, Mass.

During Blackwell's tenure, Massachusetts Mutual became, in 1975, the first commercial user of Amdahl Corp. products and developed some of the first on-line systems for insurance. In the early 1970s, the insurance firm rolled out the Respond network, which automated the hundreds of agencies selling its individual policies nationwide and linked them to each other and to the home office. In the late 1970s, the company developed the Magnet system, which performed similar functions for the 30 offices selling group life and health insurance.

Blackwell graduated from Haverford College in Pennsylvania in 1949 with a degree in political science. He served as executive director of data processing at Educational Testing Service before working with The Prudential Insurance Co. of America for 18 years.

He joined Massachusetts Mutual in 1970 as second vice-president of the EDP department, later organized the firm's Information Services Division and eventually assumed responsibility for overseeing strategic planning and information services.

Blackwell, 60, now is launching a consulting practice aimed at insurance companies and firms that want to sell to them and, with a partner, is forming Insurance Systems Roundtable to conduct research and put on meetings for sponsoring companies. Before doing so, he is taking time off in Arizona, where he was reached by *Computerworld* Senior Editor David Ludlum.

What do you see as future directions for automation in the insurance field?

Well, there's a whole new generation of [automation] coming along for most insurance companies. Their administrative systems have always been aimed at policies rather than at the individual, so that if you had 10 or 12 policies, you were represented 10 or 12 times in their data bases. Like brokerage houses and banks, the time has come to relate [a system] to a client rather than to a policy. Almost all the insurance companies are going through a study period of how they are going to make that transition. In the group life and health area . . . the price of entry is getting higher. You have to have a sophisticated claims system not only for paying claims

Continued on page 77

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Small shop

FROM PAGE 71

the man that has got to be convinced.' "

Small data processing shops such as Parkleigh, a one-store business, offer MIS professionals opportunities unheard of in large companies — like Freeman's dual role as manager of finance and DP.

Just ask Athelene Geiseman, MIS manager for Goldstein & Manello, a Boston law firm.

"It's nice to be the person who is perceived to be the mastermind behind it all," she says.

Or John Hornfeldt, who parlayed a 20-month stint as MIS director of a small agency, the Massachusetts Society for Prevention of Cruelty to Children (MSPCC), into the directorship of MIS/EDP auditing for the State Auditor of Massachusetts.

"In a small shop, you are responsible for everything, just as in a large shop, but you operate and execute everything as well," he says.

In Freeman's case, the mixture of responsibilities means his decisions about equipment purchases are closely tied to his own experience in using the system. Because he is a satisfied user, the company has relied on the same System/23 Datamaster — a product that has been discontinued by IBM — for the last five years.

Athelene Geiseman

Freeman's overriding concern about finances also means he waits until the last minute before adding equipment to the system.

"I feel much more budget pressure than another MIS manager does. But I'm freer to make a quick decision," he says.

The first major addition to the current configuration at Parkleigh did not come until people were tired of signing up on a wall chart to schedule time on the Datamaster's sole computer terminal. At that time — two years ago — a local network and two terminals were purchased.

When he decided to buy the network, Freeman exercised his dual authority by simply picking up the phone and placing the order. The network was delivered and installed within a month.

"We bought a network only for the areas where we needed it, and that was in two other offices. The network they would love to have sold us was for five terminals. But we went with what was cost-effective for us," Freeman says.

A part owner of the company, Freeman had retired from the retail business after a heart attack. But Parkleigh's owner persuaded him to return to get the $3 million specialty and gift shop back on its feet.

Shortly after he took the controller position, Freeman became DP manager out of the necessity to automate the store's financial activities. The most painful part of his DP education occurred during the installation of the Datamaster and its associated programs.

"The most difficult challenge was convincing the executives within the store to go along with what was required to make the system work. There is a large amount of back-breaking work required to develop a whole system from scratch. One has to have a tremendous amount of faith to carry it off," he says.

Creating and fine-tuning the programs for inventory control or accounts receivable required Freeman to work 70 to 80 hours a week.

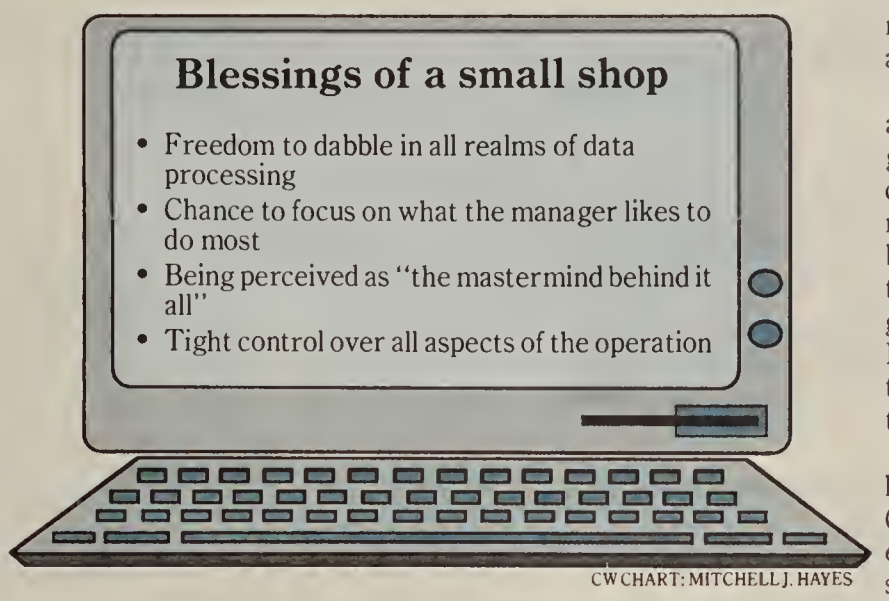
"Now, the system is blissfully sweet, and I'm beginning to act like a normal human being again," he says.

Before he moved on to his current position, Hornfeldt also worked up to 70 hours a week as MIS director for the MSPCC. Because he was one of only two full-time MIS employees, Hornfeldt spent his days hopping from task to task. His hectic schedule blurred the distinction between managerial duties and basic DP necessities.

For example, shortly before he left the society in February, Hornfeldt installed a local-area network of 20 Wyse Technology PC-286s. The project was accomplished while he continued his regular duties, which ranged from preparing for board of directors meetings to repairing equipment breakdowns.

John Hornfeldt

In the morning he did file backups and system garbage collection, and in the afternoon he would plan the best way to configure the systems in the agency's headquarters and 10 regional offices.



CW CHART: MITCHELL J. HAYES

"The blessing of a small shop is that you can make progress on a project without plodding along through a single task. Other data processing professionals are limited to a task within their job function, such as programming or operations. As the MIS director of a small shop, you can move fluidly between tasks."

Though Hornfeldt had a long-standing interest in electronics, he worked as a minister and later as a social worker before becoming a programmer and project leader. He moved into his current career track when the state agency employing him needed someone to help design a user interface for a batch system.

After successfully completing his first DP job, he moved on to subsequent projects within the Massachusetts Department of Social Services. His mixture of social services and DP positions eventually led him to the MSPCC post, where he stayed for nearly two years.

If Freeman is as much a budget watcher as he is a DP manager and if Hornfeldt is a jack-of-all-trades, then Geiseman is quickly learning the skills of a lawyer as well as an MIS director in her small shop.

For Geiseman, a typical day starts when she sits in front of her desktop terminal and checks the disk capacity of the Wang Laboratories, Inc. VS 100, which provides administrative applications for Goldstein & Manello's 75 lawyers. Assured that the system is up and running with no chance of imminent disaster, she sets to work on a long-term project, such as reviewing statistics on system performance to see if the disk drive configuration can be improved.

Inevitably, the phone rings, and Geiseman's day begins in earnest. Inquiries range from questions about obtaining certain types of accounting reports and word processing functions to when the system will provide litigation support.

Art Freeman, *controller and DP manager of Parkleigh Pharmacy.*

"I plan things to do, but I never spend my whole day doing them. There are only two of us here, and my assistant handles the hardware. When the printer is down, he gets that call. But there's only one person people perceive to be the answer person for the system, and that's me," she says.

While she maintains a comfortable 45- to 50-hour week, Geiseman must also be prepared for emergencies. For instance, the system went down recently because of a hardware problem on the main system's disk drive. That meant she had to arrive at 6 a.m. to greet the Wang technicians and analyze the problem as well as speed their progress on repairs. In the meantime, she had to get all the users who needed to operate back on the remainder of the system.

With all the users operating on three disk drives instead of the equivalent of five — the one that went down was twice as large as the others — Geiseman had to monitor the system all day and have users log off when problems developed. The phone calls during the crisis came at three or four o'clock the next morning to inform Geiseman about the status of repairs.

Fortunately, system crashes are infrequent. Geiseman's greatest challenge is not technical but managerial. Since she arrived at the firm, she has had to battle an attitude that, despite the organization's continuing growth, the current system and DP staff are sufficient to meet the law firm's needs, for now and the future.

Arguing this is especially hard because of Geiseman's age (she is 26), her relative inexperience in the business and because she is dealing with lawyers. To meet this challenge, she casts her proposals in clear, direct terms and backs them with research and lengthy documentation. For example, a recent report she wrote on the need for litigation support and access to outside data bases included footnotes referencing passages in law reviews and quotations from lawyers.

"I'm not sure I buy the argument that because I'm 26, I don't necessarily know as much as a 36-year-old MIS manager," she says.

The distinction between management and administrative or technical tasks is an important one for Geiseman because she earned her current position after working her way up through word processing departments.

She started her management career six years ago as an assistant word processing supervisor in a Washington, D.C., law firm and then became word processing supervisor at Nutter, McClennan & Fish, another Boston firm.

Despite the constant challenges of overall management and day-to-day operations, Geiseman would not trade her position for a less varied one in a larger company.

"There are times when I have to go behind the CPU and search through about 300 cables to find the one I want," she says. "But I like this position because I don't do the same thing every day. Every day is different. You miss one issue of any trade publication and you're behind. It's a little bit of a burden, but it makes life very interesting."

Incentives drive

CONTINUED FROM PAGE 71

mandate, including an incentive bonus plan for MIS employees prompted by Alamo's corporate policy of offering incentives to as many employees as possible.

For example, car washers are paid a $1 bonus for every car washed. But that pool, shared by all car washers, is docked $2 for every complaint about a dirty car.

"If you divide that up among them in proportion to their hours worked, that could be 50 cents or a dollar an hour added to their regular pay," Loane explains.

Alamo's Loane

In implementing the policy, Loane had to determine which elements were important and how to quantify them.

For computer operations, those elements included uptime and completing batch jobs and daily tasks on time. A bonus pool for the operators gets a 10-cent contribution for every minute of uptime when the average response time is better than one second. But the pool is debited $10 for every minute of downtime.

"Simple math will tell you that the break-even point is 99.5% uptime, which is the service level that we originally set. If you are doing a good job at 99.9% you are going to wind up with a bonus that could be $300 a month. But there also have been months when they got nothing," Loane says.

Batch jobs earn the operators' pool $25 for each day all reports are on time, but $50 is subtracted for each day even one report is late.

The programming staff has a separate pool, which grows or shrinks based on whether the company makes money, projects are on time and systems are reliable.

A company profit of 1% earns the programming staff a bonus of 2% of their salary. There also is a $100,000 pool that is doled out on the basis of the timeliness of completed programming projects, with major projects bringing in $5,000 to $25,000 to be split among the group. But reliability becomes a factor since the programmers' pool grows by $100 per day when there are no CICS outages and shrinks by $200 per day when there are outages.

Bonuses depend on more than the workers' ability to keep systems running or to complete projects on time, however. They are subject to the failings of manufacturers' mistakes when equipment defects bring down a system and to airlines that drag their feet on joint Alamo-airline projects.

If a thermal conduction module fails in the 3090 mainframe, operators must minimize the downtime by getting around the failure and restarting the system. The programmers collected only 60% of their $100,000 timeliness pool last year, in part because some airlines were slow in implementing joint projects.

Alamo officials say they have found no other companies that provide incentive bonuses to such a broad range of employees; many firms offer bonuses only to the upper 10% of management.

Loane emphasizes that the incentives are in addition to the employees' regular salaries. The bonuses are limited to 25% of a worker's base salary.

By way of the 4-year-old program, MIS bonuses last year tended to be in the $2,700 to $5,400 range. Loane notes that operations personnel reached their goals in 10 to 12 months in 1986, and that those goals were made slightly tougher to reach this year because of improving hardware reliability.

"Everybody's success is based on everyone else's," Loane says. "We want our employees to be fanatics. We want people who are gung ho about their jobs. If someone screws up the bonus for everyone else, they are going to hear it from everyone else."

Training courses receive awards

ATLANTA — Computer-based training courses developed by the state of Tennessee and Blue Cross/Blue Shield of New Jersey have won awards from Goal Systems International, Inc.

The Phoebe prizes are awarded on the basis of creative use of Phoenix, Goal Systems' computer-based training system. Finalists were chosen by judges for regional Phoenix users groups and the winners by judges at the Sixth International Phoenix User Group Meeting.

A training course entitled "Dbase II," developed by Ken Kimbro for the state of Tennessee, was chosen as best course for its "clever use of graphics and scenarios to tell a story," said Rita Richterkessing, a Goal Systems marketing manager.

An award for the most creative or unique use of Phoenix went to "MMIF," which stands for major medical information, developed by Brian Flynn for Blue Cross/Blue Shield.

The judges' criteria included screen design, student appeal and interactivity, instructional design and simulations.

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CALENDAR

MAY 3-9

AUUA, Inc. (Sperry Users) Spring Conference. Orlando, Fla., May 3-7 — Contact: Randal L. Leonard, Gay & Taylor, Inc., P.O. Box 1410, Winston-Salem, N.C. 27102.

BLIS/COBOL Users Group Annual Meeting. Orlando, Fla., May 3-7 — Contact: BLIS/COBOL Users Group, Suite 110, 222 S. Westmonte Drive, Altamonte Springs, Fla. 32715.

Eighth Annual Meeting of the International Association of Synercom Users. Houston, May 3-7 — Contact: Gary Carson, Synercom, 10405 Corporate Drive, Sugar Land, Texas 77478.

Second International Conference on Supercomputing and First World Supercomputer Exhibition. Santa Clara, Calif., May 3-8 — Contact: Lana Kartashev, Dynamic Computer Architecture, Inc., Suite B-309, 3000 34th St. S., St. Petersburg, Fla. 33711.

Computers & Communications in the Healthcare Industry. Dallas, May 4-5 — Contact: Frost & Sullivan, Inc., 106 Fulton St., New York, N.Y. 10038.

Eastern Communications Forum 87. Stamford, Conn., May 4-6 — Contact: ECF, 505 N. Lake Shore Drive, Chicago, Ill. 60611.

BankAI. Brussels, May 5-6 — Contact: Society for Worldwide Interbank Financial Telecommunications, AI Business Unit, Avenue E. Solvay 81, 1310 La Hulpe, Belgium.

Eighth National Online Meeting. New York, May 5-7 — Contact: Learned Information, Inc., 143 Old Marlton Pike, Medford, N.J. 08055.

18th Annual Meeting of the Applications Software, Inc. Users' Group. New Orleans, May 5-8 — Contact: University of Michigan, Data Systems Center, 2021 Administrative Services Building, Ann Arbor, Mich. 48109.

Second International Optical Storage Forum. Denver, May 6-8 — Contact: Cartlidge & Associates, Inc., Suite M259, 1101 S. Winchester Blvd., San Jose, Calif. 95128.

Southern California Regional Users Group Annual Trade Show & Conference for Hewlett-Packard users. Pasadena, Calif., May 6-8 — Contact: Karen Zimmerman, SCRUG '87, P.O. Box 84219, Los Angeles, Calif. 90073.

1987 International Conference & Exhibition on Health Industry Bar Coding. Atlanta, May 6-8 — Contact: Automatic Identification Manufacturers, Inc., 1326 Freeport Road, Pittsburgh, Pa. 15238.

The *Fortune*/Seybold Group Desktop Productivity Conference: Turning Expectations into Realities. New York, May 7-9 — Contact: The Seybold Group, Inc., Suite 100, 100 Homeland Court, San Jose, Calif. 95112.

MAY 10-16

Software Maintenance. Toronto, May 10-13 — Contact: Interex, 680 Almanor Ave., Sunnyvale, Calif. 94086.

APL87. Dallas, May 10-14 — Contact: APL87 Registrar, Suite 210, 440 Northlake Shopping Center, Dallas, Texas 75238.

VIP '87 — Duquesne Systems International Users Group. Chicago, May 11-12 — Contact: Donna Bartko, Duquesne Systems, Inc., Two Allegheny Center, Pittsburgh, Pa. 15212.

Audit Managers' Symposium IX. Hilton Head Island, S.C., May 11-13 — Contact: Jane Evans, MIS Training Institute, 4 Brewster Road, Framingham, Mass. 01701.

National Info/System User Group Conference. Philadelphia, May 11-13 — Contact: Mike Turgeon, Northeast Info/System User Group, P.O. Box 1698, Boston, Mass. 02205.

CD-I/The Future Conference. San Francisco, May 11-13 — Contact: Carol Peters, Online International, Inc., 989 Avenue of the Americas, New York, N.Y. 10018.

Desktop Publishing '87. San Francisco, May 11-13 — Contact: Carol Peters, Online International, Inc., 989 Avenue of the Americas, New York, N.Y. 10018.

APICS Logistics Conference and Technical Exhibit. Dallas, May 11-14 — Contact: Communications Department, American Production and Inventory Control Society, Inc., 500 W. Annandale Road, Falls Church, Va. 22046.

Intercompany Networks: Strategy and Implementation. New York, May 12-13 — Contact: William Smulsky, The Yankee Group, 200 Portland St., Boston, Mass. 02114.

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Blackwell

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but for gathering claims data and helping the client keep his costs down, and that's being implemented through fairly sophisticated new computer systems. In the long run, I think only a few companies will be able to finance the cost of entry in that area.

Can you assess the state of alternatives to IBM now compared with it in 1975?
If you're looking at the plug-compatible mainframe area, you still have Amdahl and NAS as the two alternatives [for] the people that are in an IBM mode, which, after all, in the insurance business happens to be almost everybody. So I think there's still an opportunity there, not only in the mainframe but in disk and in tape. And I see that opportunity continuing.

The insurance industry, like all industries, is putting in more and more workstations instead of dumb terminals, and I guess it's a little early to assess what the new IBM announcement is going to mean. Many of them have been content to use the original PC base, and I wonder whether or not they aren't so entrenched with that that they may be reluctant to move up both in the cost and the change that's required to take into account the functionality.

In the management area, I think you can see that the standard that was set by Apple for user-friendliness, to use a trite word, has now really been picked up by IBM; and they're all sort of [following] the same approach. And I think that will effectively put workstations on most management desks in the insurance business. It happens to be coming along at a time when access to data is also becoming much easier. You see the ability for the first time, really, to do what we've been talking about for 20 years — and that's [to] set up management information systems instead of processing systems.

What would you say is the most important principle for an information systems organization in the insurance field?
There are two very different models for that, and I wouldn't say that one is better than the other. It really depends on what's happening organization-

David Blackwell

ally in the rest of the company.

One model is to decentralize strategic business units, and the other is to keep [information systems] heavily centralized. And I think which of those is used really depends almost entirely on how the rest of the company is organized. If the company becomes heavily decentralized . . . then it probably makes a lot of sense to break the pieces apart and embed them in strategic business units. Some companies have elected to continue to run it as a centralized service organization. You can make a case for either one, depending on the environment.

What would you say are the most important qualifications for an information systems director in business?
Well, he has to be a businessman first and a DPer second. I think that's the primary qualification. I think the technology changes rapidly enough that a fellow can really become pretty knowledgeable pretty fast in the technology.

I used to think we had a five-year rollover; I think it's probably more like 3½ or four years now. [An information systems manager] can also become technologically obsolete fairly rapidly. So the critical thing for him to be is a good manager.

How have end users changed most significantly since you began working closely with them?
They've become much more involved and knowledgeable. If you go back, even to the time I came to the Mass. Mutual 17 years ago, they liked to tell an organization what to do and expected it to be delivered later on without much intervention. That's no longer true in most organizations. People are deeply involved, and I think the PC and the educational programs in universities have made them all much more computer literate. And, therefore, they want to get involved and are capable of getting involved.

Now, a salesman still wants to be a salesman and not a data processor. But he knows much better what to ask for now than he once did. And I think that trend will continue. People will become more and more computer literate as the educational system changes.

What do you find most surprising in looking back at the evolution of systems and their use?
Well, you know things don't happen as rapidly as a lot of us think they could. I think many of us have been bullish over technology changes and thought things would happen much more rapidly. They could have, technologically.

I think you find that people resist change, including data processing people, and that the change has been slower.

If I've been surprised, it's because change has been slower than one would have thought it could have been. When we put in Respond, for example, we expected every other insurance company to react within two or three years and leapfrog us. The fact is that there are companies 12 years later that haven't even matched it yet.

So I guess if there's been any surprise, it's been the slowness with which technology has been introduced.

Mold training to individual

WELLESLEY, Mass. — Responsiveness to computer training may vary with the type of intelligence exhibited by an individual, according to an information systems consultant and psychiatrist.

The type of intelligence can affect how someone learns, according to Theodore Reid of Phoenix, a psychiatrist and consultant with the Dooley Group who addressed a workshop last week sponsored by the Center for Information Management Studies at Babson College.

Users whose intelligence tends toward a logical-mathematical classification as well as a musical one tend to respond relatively well to programmed instruction, Reid said.

In contrast, users whose intelligence is predominantly verbal do well by reading documentation, while those who lean toward spatial or artistic intelligence do better when they are first presented with an overall concept.

Users whose intelligence is of a personal nature — focusing on their own or other people's feelings — learn best through individual or small group instruction, Reid said.

On-line service supports professional trainers

RAQUETTE LAKE, N.Y. — A nonprofit organization is exploiting another computer application for the training of computer users in a new on-line network available through Compuserve Information Service from Compuserve, Inc.

National Training and Computers Project is sponsoring DPTrain, which it calls an on-line cooperative, or forum, aimed at advocating quality in computer training and support and encouraging those who train computer users.

"Most organizations are continually reinventing the same wheel," said Elliott Masie, executive director of the project. "DPTrain is an effort to share resources and improve the quality and effectiveness of computer training," he explained.

After two months of operation the service has 1,000 members, according to a statement from its sponsor. There are no fees for using the service beyond the normal connect charges for the Compuserve Information Service.

The service features public-domain courseware, reviews of hardware and software products that focus on the ease of teaching users to operate the products, on-line seminars for trainers and listings of job openings and resumes.

"The scale of computerization efforts is mind-boggling," Masie said. "We are seeing plans for 20,000 to 30,000 users to be added to corporate systems within a 12-month period. Those efforts require a real sensitivity to the training issues."

Quality group

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ognize members' accomplishments to their superiors, Salinger explains.

Educational programs, which will emphasize personal and business skills, are to include seminars, publications featuring success stories and tutorials and opportunities for networking, such as computer conferences.

Salinger says that while quality assurance professionals must know certain techniques, many of their failures have come from lack of skills such as team leadership, communication, negotiation and self-marketing.

Technical skills

Technical skills the group will emphasize include metrics, structured system development methods, security standards, performance monitoring, measures of hardware capacity, design and code reviews and documentation conventions.

The chairman of the society is Pat Ragozzino, a senior manager with Peat, Marwick, Main & Co. in Cleveland.

The vice-president is Belden Menkus, a consultant based in Middleville, N.J. Edward Kimball, a program scientist with Vector Research, Inc. in Ann Arbor, Mich., is secretary and Lawrence Tracey, a senior program manager with Unisys Corp. in Detroit, is treasurer.

Big Brother

FROM PAGE 71

has 20 of the GAO's auditors with offices inside its computer center in Baltimore.

Much of this scrutiny is justified, of course, since the money spent on federal DP systems comes from U.S. taxpayers, and the government lacks the inherent profit-making and cost-cutting incentives of the business community.

But the next time you snicker at the computer problems of the Internal Revenue Service or another agency, consider what it is like to be grilled by a congressional subcommittee.

You sit at a big wooden table in an ornate hearing room. There's a microphone on the table, hot television lights in the corners, a court reporter making a transcript and a rowdy group of blood-hungry reporters at the press table. You raise your right hand and swear to tell the truth, just like on *Perry Mason.*

The congressional committee has already heard the testimony of the GAO auditors, who have said your system is rotten to the core.

The committee chairman starts shooting questions at you in prosecutorial fashion.

(Actually, many legislators are former prosecutors. They know very little about computers, but they are fed the tough questions by young aides who read the GAO reports.)

Beads of sweat appear on your forehead.

Sometimes the legislators get rather theatrical, particularly when the TV cameras are rolling. One congressman, trying to dramatize his criticism of the Securities and Exchange Commission's so-called Edgar system, held up big flash cards showing each of Edgar's initials. (Edgar stands for Electronic Data Gathering, Analysis and Retrieval.)

One by one, the congressman threw the cards up into the air as he charged that the Edgar system is no good at gathering, analyzing or retrieving data.

'Political theater'

"Congressional hearings have always been a form of political theater," according to a recent article in *Roll Call,* the weekly newspaper on Capitol Hill. "But Watergate turned them into a media version of the Spanish Inquisition, with lawmakers barbecuing witnesses every day for months on national TV."

Roll Call says that Washington public relations firms now offer services to help congressional witnesses handle the tough questions and the pressure, including staging mock hearings.

Their advice includes the following:

- Don't take the Fifth Amendment unless you're in the Mafia — it makes you look guilty.
- Wear conservative clothing and get rid of nervous habits, like tapping a pencil on the table.
- If you don't know the answer to a question, say, "I don't have an answer for that, but I'll get it for you."
- Above all, don't cry. That means you are out of control.

Betts is *Computerworld's* Washington, D.C., correspondent

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Continued from page 76

Infobase '87 — International Database Exhibition and Congress. Frankfurt, West Germany, May 12-14 — Contact: Messe Frankfurt GmbH, Ludwig-Erhard-Anlage 1, POB 97 01 26, D-6000, Frankfurt 97, West Germany.

The Information Advantage. London, May 13-14 — Contact: The Conference Board, Inc., P.O. Box 4026, Church Street Station, New York, N.Y. 10261.

Avignon 87 — Expert Systems and their Applications. Avignon, France, May 13-15 — Contact: Avignon 87, B.P. 45, 92193 Meudon-Cedex, France.

Network Users Association Spring Meeting. Atlanta, May 13-15 — Contact: Network Users Association, Suite 400, 2111 Eisenhower Ave., Alexandria, Va. 22314.

Federal Conference on Electronic Publishing. Bethesda, Md., May 13-15 — Contact: Cahners Exposition Group, P.O. Box 3833, 999 Summer St., Stamford, Conn. 06905.

Eighth Annual Computer Law Institute. Los Angeles, May 14-15 — Contact: University of Southern California Law Center, University Park, Los Angeles, Calif. 90007.

Impact 87 — Technology in Tomorrow's Classroom. Victoria, B.C., May 14-17 — Contact: Conference Services, Box 1700, University of Victoria, Victoria, B.C., Canada V8W 2Y2.

Conference on Human Factors in Computing Systems. Washington, D.C., May 15-19 — Contact: Association for Computing Machinery Conference Management, 11 W. 42nd St., New York, N.Y. 10036.

MAY 17-23

INTEC '87: The Conference on Information Resources & Technology Applications. Washington, D.C., May 17-20 — Contact: Carol Simon, Information Industry Association, Suite 800, 555 New Jersey Ave. N.W., Washington, D.C. 20001.

Infoweek '87. Dallas, May 17-20 — Contact: Uccel Corp., Marketing Communications c/o Financial Systems Division, P.O. Box 660054, Dallas, Texas 75266.

International Communications Association 1987 Conference & Exposition. New Orleans, May 17-22 — Contact: ICA, Suite 710, LB-89, 12750 Merit Drive, Dallas, Texas 75251.

The Challenge of Evolving Technoiogies Conference. Orlando, Fla., May 18-20 — Contact: Scott K. Allen, Life Office Management Association, 5770 Powers Ferry Road, Atlanta, Ga. 30327.

Servcon '87: Service and Support for the '90s. New York, May 18-20 — Contact: CESN Publications, Inc., P.O. Box 428, Peterborough, N.H. 03458.

Hammer Forum West — Harnessing New Technology: From Vision to Reality. Los Angeles, May 18-20 — Contact: Michael Hammer, Hammer Forum West, 5 Cambridge Center, Cambridge, Mass. 02142.

Meeting of the Minds '87, ADP National Accounts Division Users' Conference. Boston, May 18-20 — Contact: Automatic Data Processing, Suite 580, 5665 Northside Drive, Atlanta, Ga. 30328.

Patricia Seybold's Technology Forum — Tools for Visionary Business Users. Cambridge, Mass., May 18-20 — Contact: Patricia Seybold's Office Computing Group, Suite 612, 148 State St., Boston, Mass. 02109.

Navy Micro/OA '87. Virginia Beach, Va., May 18-21 — Contact: NARDAC Norfolk, Navy Micro/OA '87, Norfolk, Va. 23511.

Eighth Annual Conference on Applications of Computer-Aided Systems Engineering Tools. Ann Arbor, Mich., May 18-22 — Contact: Rebecca S. Sizemore, Meta Systems, Ltd., Suite 200, 315 E. Eisenhower, Ann Arbor, Mich. 48108.

Second International Symposium on the Factory of the Future. Montego Bay, Jamaica, May 18-22 — Contact: David W. Russell, Pennsylvania State University Graduate Center, 650 S. Henderson Road, King of Prussia, Pa. 19406.

New Aids to Executive Decision-Making. New York, May 19-20 — Contact: The Conference Board, Inc., P.O. Box 4026, Church Street Station, New York, N.Y. 10261.

Western States Government Technology Conference 87. Sacramento, Calif., May 19-21 — Contact: Government Technology Conference, P.O. Box 160288, Sacramento, Calif. 95816.

Technobank. Geneva, May 19-22 — Contact: Technobank, P.O. Box 625, CH-1211 Geneva 1, Switzerland.

Interconnections '87, the Independent Computer Consultants Association's 10th Annual National Conference. San Francisco, May 20-22 — Contact: ICCA, P.O. Box 27412, St. Louis, Mo. 63141.

Distribution Computer Expo. Chicago, May 21-22 — Contact: C. S. Report, Box 453, Exton, Pa. 19341.

1987 NYU Symposium: Technological Support for Workgroup Collaboration. New York, May 21-22 — Contact: Center for Research on Information Systems, New York University, 90 Trinity Place, New York, N.Y. 10006.

MAY 24-30

Icographics '87: Second International Conference and Exhibition on Computer Graphics. Milan, Italy, May 26-29 — Contact: World Computer Graphics Association, Inc., Suite 399, 2033 M St. N.W., Washington, D.C. 20036.

Workshops on Computer-Assisted Map Analysis. New Haven, Conn., May 27-28 — Contact: Joseph K. Berry, School of Forestry and Environmental Studies, Yale University, 205 Prospect St., New Haven, Conn. 06511. Also being held June 9-10 in Tucson, Ariz.; June 17-18 in Athens, Ga.; Sept. 16-17 in Corvallis, Ore.; and Oct. 24-25 in Berkeley, Calif.

CASE '87. First International Workshop on Computer-Aided Software Engineering. Cambridge, Mass., May 27-29 — Contact: Elliot Chikofsky, Index Technology Corp., One Main St., Cambridge, Mass. 02142.

1987 Information Management Conference. Toronto, May 27-29 — Contact: John Hobbs, Data Base Association (Ontario), Inc., P.O. Box 5639, Station A, Toronto, Ont., Canada M5W 1N8.

ACM Professional Development Seminars. Boston, May 30 — Contact: Gerry Hayes, Cullinane Hall 161CN, College of Computer Science, Northeastern University, 360 Huntington Ave., Boston, Mass. 02115.

Make these "people" laugh, and you could win $100 worth of software.

Announcing the 1987 Computerworld button contest!

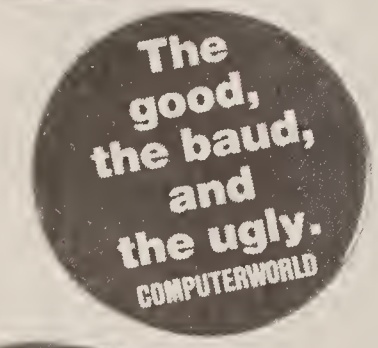
Every year, as all you button freaks know, Computerworld distributes tens of thousands of buttons at trade shows around the country. For several years now, against our better judgment, we have been letting you, our readers, write these buttons. To our surprise, you have written some good ones (like those shown here). So, we're doing it again.

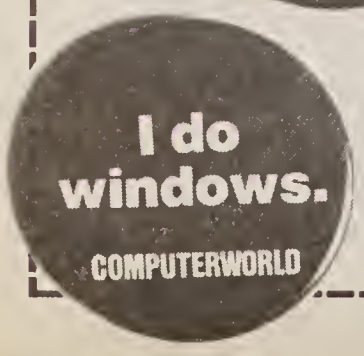
We're looking for a few good slogans — witty, relevant, SHORT (these are small buttons), and at least moderately clean. You may send in your entries on the form below or a copy.

But you may NOT send us everything that comes into your head. Our offices aren't big enough to handle all that paper! Please take the time to narrow your ideas down to the two best you can come up with (test them on your friends).

All entries will be shown to our panel of judges, who will be tied to their chairs until selections are complete. Six winning slogans will be picked, and everyone who sent in one of those slogans will be eligibile for a prize. If you are the only one to send in a winning slogan, you win the prize. If more than one person had the same intelligent idea, we'll pick the prize winner out of a hat. Prize winners will receive a $100 certificate good towards the purchase of software from a friendly neighborhood computer store.

All decisions of the judges will be final, and no representations as to their competence, skill, or sense of humor are being made. All entries will become the property of CW Communications/Inc. Deadline for entries is May 1, 1987 at our offices in Framingham, MA.





YES, I'd like to enter Computerworld's ridiculous button contest. My two slogans are written below. I understand the rules above, and realize that these entries will become the property of CW Communications/Inc. I hope your judges can read!

_____

_____

_____

_____

Name: _____

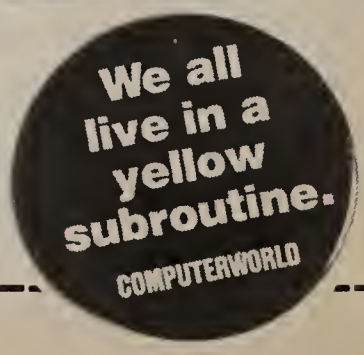
Company: _____

Address: _____

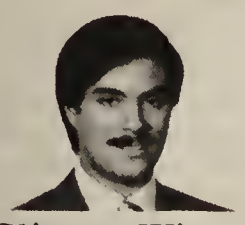
City: _____ State: _____ Zip: _____

Phone (in case I win): _____

SEND TO: Mary Doyle, Computerworld, Box 9171, Framingham, MA 01701-9171.



INDUSTRY INSIGHT



Clinton Wilder

A different shade of blue

When IBM Chairman John F. Akers steps up to the podium in New Orleans this morning to address his shareholders at the IBM annual meeting, he will do so as the leader of a company in the unaccustomed throes of change.

In the first 100 business days of this year, the Big Blue elephant has been kicking up quite a lot of dust. Spurred by two straight years of declining earnings and the unprecedented (at IBM's expense, anyway) success of rival Digital Equipment Corp., IBM has sent all kinds of signals out to the industry so far this year.

IBM has billed 1987 as the year of the customer, which may be debatable. But it has unquestionably been the year of the IBM news release. Listed together, a sampling of this year's events emanating from Armonk, N.Y., almost boggles the mind:

- The upgraded 3090E series mainframes. In any other year, this might have been *the* big first-quarter announcement; this year, it paled in significance compared with others.
- The new generation of Personal System/2 micros and the Operating System/2: How to shake up an entire industry in one day. This could be the ultimate test of IBM's market clout, but its grades will not be in for another two years.
- Systems Application Architecture. What is it? Either a brilliant and long-overdue strategy to integrate IBM's product line or a vague smoke screen to throw DEC off stride.
- The Corporate Service Amendment. A very aggressive move for account control and wreaking havoc in the independent maintenance industry. On this one, users win all around.
- Letting the IBM sales force market hardware coming off IBM Credit Corp. leases. Independent dealers, brokers and lessors do not like it, but business is business, right?

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Cincom sheds low-key image

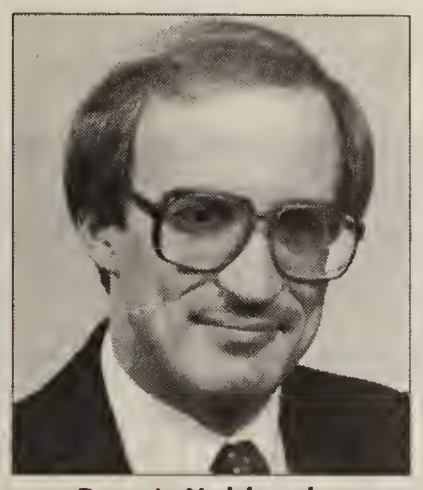
BY JEAN S. BOZMAN
CW STAFF

CINCINNATI — Traditionally a leader in software technology, Cincom Systems, Inc. has often advanced in product development at the expense of bottom-line sales. But with the planned introduction of several products this year, Cincom may be contemplating the ultimate reversal of its quiet image: going public.

"My charter," says Cincom President and Chief Executive Officer Dennis Yablonsky, "is to make the world aware of the great secret that is Cincom."

Yablonsky says Cincom is poised for a period of sustained growth that could bring the company's sales to the $200 million level by 1992. The firm, which has devoted much of five years to developing products based on the Supra relational data base management system (DBMS), will now turn its attention toward marketing.

Yablonsky describes the company as "product-rich," adding that Cincom would try to be more market-driven than it has been in the past. Yablonsky says he expects Cincom's sales to reach the $120 million mark by the time its fiscal year ends in December, and employees are already talking about a possible prospectus describing the company's public offering of stock.



Dennis Yablonsky

Cincom's low-key image arises in part from the firm's relative geographic isolation in company founder Thomas Nies's hometown in the heart of the Ohio River Valley. Each week, Cincom's top management plays host to customers and business partners flying in from the traditional software corridors of Boston and San Francisco.

But Cincom has a strong international presence that belies its landlocked, midwestern home. Some 45% of Cincom's revenue comes from sales in Europe, Japan, Australia and South America, particularly Brazil. Cincom maintains 60 offices around the world; an international network links these offices and provides a means of software support and remote diagnostics for far-flung customers.

In the U.S., Cincom kept a relatively low profile while it undertook an intensive period of software writing, dating from about 1982 to 1985. That was the time period when Cincom's software engineers laid the groundwork for Supra and related products.

Since 1979, Cincom estimates, the company has spent an estimated $100 million for product development.

One result of the Supra emphasis was that Cincom lost its foothold on the software systems marketplace. "Cincom lost market share because it was getting ready to enter the relational market," says Ronald R. Hank, senior manager for corporate relations. "We were about 18 months late with the Supra product."

Cincom does not intend to make that kind of miscalculation again. This year, as a shift toward marketing and sales speeds up, Cincom says research and development expenditures will slip below 20% of sales for the first time in recent years.

Along with the move to marketing comes another toward multiple-vendor support. Cincom's product focus has shifted from a predominantly IBM line-

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Aspen gets Aweida in stock swap

BY JAMES A. MARTIN
CW STAFF

LONGMONT, Colo. — Aspen Peripherals Corp. said last week it has acquired Aweida Systems Corp. through a stock swap and named Storage Technology Corp. founder Jesse Aweida president and chairman of the merged companies.

The value of the acquisition was not disclosed.

In theory, the merger seeks to combine Aspen's manufacturing strengths with Aweida Systems' marketing capabilities. Aspen Peripherals is a recent start-up company that last year introduced its only product, the

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Inside

Vendors remain cautious despite boom quarter

BY ALAN J. RYAN
CW STAFF

The first three months of this year have brought higher than anticipated earnings and sales in many segments of the computer industry, but most companies said they will continue to keep tight cost controls in place.

Orders were up for the quarter, and companies said order rates increased steadily as the period progressed, with the highest activity being reported in March.

"We think the computer economy has turned, basically," said analyst Peter Labe of Drexel Burnham Lambert, Inc. "I don't mean we're in some boom period, but it has very clearly turned."

Financial reports released last week include the following:

Prime Computer, Inc. Cost controls and a surge in orders late in the first quarter were credited for higher than expected earnings, analysts said last week.

The Natick, Mass.-based vendor posted a 28% increase in income on a 13% rise in sales for its first quarter ended March 30.

For the period, Prime announced income of $11.9 million, or 24 cents per share, on sales of $221.7 million. In the comparable quarter in 1986, earnings were $9.2 million, or 19 cents per share, on sales of $196.8 million.

"As Prime has a new product cycle coming later this year that will benefit them, we expect the [increased earning] trend to continue," said analyst Michael Geran of E. F. Hutton & Co. Geran forecast earnings of 28 cents per share for the current second quarter.

"Given the general economic uncertainty, we will continue to manage our expenses carefully while maintaining our significant investment in research and development funding, which now totals more than 11% of revenue," said Joe Henson, Prime's president and chief executive officer.

Unisys Corp. The corporation formed through the merger of the former Burroughs Corp. and Sperry Corp. announced sales of $2.4 billion and income

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1987 first-quarter earnings

Unisys bounces into the black; earnings and sales improve throughout the industry

Company	Net Income Jan.-March (thousands) of dollars)	Percent Change from 1986	Revenue Jan.-March (thousands) of dollars)	Percent Change from 1986
Altos	2.8	−10	40.4	+7
Amdahl	25.2	+950	318.5	+59
Bridge Communications	1.6	+61	15.3	+66
Computer Consoles	0.8	—	35.6	+67
Micom	4.3	+169	52	+11
Prime	11.9	+28	221.7	+13
Software Publishing	1.6	+334	10.9	+91
Stratus	3.7	+21	37.4	+39
Tandy	50.4	+20	776.9	+12
Unisys	110.2	—	2,400	—
VM Software	0.79	+22	6.3	+46

CW CHART

Computer Consoles targets Wang 2200 users

BY ALAN ALPER
CW STAFF

WALTHAM, Mass. — Seeking to expand its share of the office automation systems market at the expense of faltering competitors, Computer Consoles, Inc. is leveraging a software strategy aimed at winning resellers and ultimately converting users to its Unix-based Power systems.

"We're going after the wounded," said John Cunningham, Computer Consoles chairman and chief executive officer.

Computer Consoles is focusing its initial efforts on wrenching customers from struggling Wang Laboratories, Inc., the company from which Cunningham resigned as president in a highly publicized move in 1985. Computer Consoles recently announced a C compiler that enables office applications developed in Basic for the Wang 2200 to run on its Power minicomputers under Unix. The firm is also expected to soon release a C compiler for applications written for Wang's popular VS system.

Computer Consoles, which is on the mend itself, revealed it is also planning to unveil compilers for the machines of other office automation systems vendors, including Datapoint Corp. and Prime Computer, Inc.

Computer Consoles hopes to penetrate Wang's large customer base, which is said to be frustrated by the firm's inability to get leading-edge products to market in a timely fashion.

The Wang focus gives Computer Consoles's value-added resellers a broad target market. Wang has shipped about 70,000 2200 systems and about 65,000 VS systems, former Wang sales and marketing executives said.

The compiler for the 2200 gives Computer Consoles access to some Wang resellers that have recently been flushed out by the vendor, noted George Colony, president of Forrester Research, Inc. The compiler for VS systems would give Computer Consoles entry to Wang's

John Cunningham

Fortune 1,000 customers, a market in which the firm has a marginal presence, he added.

"CCI is groping for a sales strategy," Colony said. "In going after Wang, they're seeking a well-defined market that is ripe for the picking."

Computer Consoles said its Power series offers Wang users a higher performance and lower cost hardware platform on which to run familiar applications. The 2200 is an early 1970s vintage machine that supports about 16 users. Computer Consoles's Power6/32 minicomputer supports more than 100 users.

"The 2200 is an old product line for Wang that is not going anywhere for them," Cunningham said. "This gets us into the Wang market and users into the integrated software world with [our integrated office automation system] Officepower."

Colony said Wang users might be attracted to the power and portability of Computer Consoles's Unix-based systems. Computer Consoles's success in the Wang market, Colony said, will come down to outselling and outservicing its competitor. "That probably won't be difficult," he suggested.

The C compiler for the 2200 — called Basic-K compiler — was developed by Kerridge Computer Co. in the UK, a reseller that handles both Wang and Computer Consoles sys-

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Vendors decry stiff U.S. trade export controls

Say laws protecting sensitive technology cripple access to foreign markets

BY JAMES A. MARTIN
CW STAFF

SAN JOSE, Calif. — The U.S. government's trade export controls on high technology are completely outdated and serve mainly to impede competition among American companies overseas, according to Silicon Valley companies that testified at a hearing earlier this month.

"Technology is moving so fast the government has no ability to keep track of it," said Rep. Norman Y. Mineta (D-San Jose). "In some cases, the process of obtaining an export license for a product may take longer than the product's actual technological life cycle."

The U.S. Departments of Commerce and Defense, among other government entities, are concerned that sensitive American technology will find its way into communist or unfriendly countries. As a result, high-tech companies wishing to ship products overseas are often faced with a bureaucratic quagmire resulting in pounds of paperwork and months of delays and frustrations.

Such restrictions have helped more to create a blooming U.S. trade deficit than they have to keep important technology out of the hands of unallied governments, according to testimonies. Meanwhile, competing firms in Japan and other countries without those controls are able to move products and satisfy customers much more easily.

Robert G. Smith, vice-president and chief financial officer of Sun Microsystems, Inc., testified that after Sun introduced its latest generation of microcomputer workstations in September 1985, the company found itself burdened with bureaucratic requirements when attempting to export.

"We were told we would have to receive, from the Department of Commerce, an individual approval for every machine we exported," Smith said. Additional approvals were required to ship products to countries not affiliated with the Coordinating Committee on Multilateral Export Controls, an informal alliance formed to restrict strategic trade exports to communist countries.

Waiting for Washington

"You can ultimately see what this did to our selling cycle," Smith added. "Once the sale was made, the foreign customer had to wait weeks for Washington to approve the resale by our foreign subsidiaries to them. As a result, it often took months for our foreign customers to receive their products. It's impossible to determine how many foreign customers we lost because of this delay."

Seven years ago, the U.S. high-tech industry enjoyed a trade surplus of $27 billion, compared with a trade deficit of $3 billion in 1986. In addition, the National Academy of Sciences found in a recent study that export controls cost the U.S. some 188,000 jobs and $9 billion a year.

"By making it exceedingly difficult for Silicon Valley companies to market their products overseas, our own government is sabotaging this once-model industry," said Rep. Don Edwards (D-San Jose).

"It's apparent that our businesses here can compete in Japan or anywhere else they want to if the government wouldn't get in their way," Edwards said.

Computer Consoles

CONTINUED FROM PAGE 84

tems. Cunningham said Computer Consoles is working with an outside company, which he declined to name, to develop the compiler for the Wang VS system.

Working with value-added resellers has enabled Computer Consoles to broaden its market penetration without throwing sales expenses into disarray, he noted.

Apparently, the strategy has begun to pay dividends. For its first quarter of fiscal 1987, Computer Consoles posted a 68% increase in sales, to $35.6 million, compared with $21.2 million in the comparable quarter in 1986.

Computer Consoles's modest net income of $800,000, or 6 cents per share, included a credit of $300,000, or 2 cents per share. In the first quarter last year, a loss of $5.6 million, or 47 cents per share, was recorded.

The company said first-quarter orders received by the company's California-based computer products division exceeded expectations. Sales to customers in the communications systems industry in the first quarter also improved.

Computer Consoles, which was hemorrhaging when Cunnigham took over 20 months ago, has been profitable for three consecutive quarters. The firm is projecting a pretax profit of about $8 million this year on revenue of $169 million.

Continued profitability, Cunningham said, will help build confidence in Computer Consoles's office automation strategy. "You don't do it with smoke, rumors and talk but with financial numbers," he concluded.

Staff writer Alan J. Ryan contributed to this story.

Hogan rebounding; IBM aid not crucial

BY ALAN ALPER
CW STAFF

NEW YORK — Hogan Systems, Inc., the once-foundering banking software company that has IBM as its exclusive distributor in the U.S. and Canada, is making a comeback without much assistance from the industry leader.

Speaking to securities analysts here last week, George McTavish, Hogan's president and chief executive officer, pointed to expense reductions and contracts signed with European banks as primary factors in the Dallas firm's resurgence.

For the first nine months of fiscal 1987, Hogan's revenue is up 36% to $30.7 million, while operating profits are $4.8 million, compared with a $4 million loss for the corresponding period last year. Hogan expects to release its fourth-quarter results this week.

According to McTavish, little of Hogan's recent growth can be directly attributed to the firm's 11-month relationship with IBM. IBM introduced a Solutionpac based on Hogan's integrated retail banking application software last October and made its first customer shipment in February, according to Ralph Clark, general manager of the services sector of IBM's Information Systems Group and one of two IBM representatives at the analysts meeting.

McTavish declined to say how much of Hogan's revenue resulted from its relationship with IBM. "IBM is not responsible for Hogan's growth. IBM is responsible for meeting the marketing of our product domestically," he explained.

Osman Eralp, an analyst with Hambrecht & Quist, Inc., said even if IBM does not sell any Hogan software in fiscal 1988, Hogan's revenue should still grow by between 10% and 20%. Hogan's disassembling of its domestic sales force, tighter expense controls and strong European business have put the company on solid financial ground, he said. Hogan has recently inked big contracts with Midland Bank PLC in the UK and with banks in Holland and Portugal.

"I don't want to paint too rosy a picture, because there can always be problems for a company that does not have a domestic sales force," Eralp said. "But compared with where they were a year and a half ago, they're now a real solid growth company."

Stephen McClellan, an analyst at Merrill Lynch & Co. who follows IBM, said it remains to be seen if Hogan's relationship with IBM will pay off. While the company has turned profitable after two consecutive years of losses, McClellan is uncertain whether the firm can flourish as a result of its IBM connection.

"They've sown the seeds, but they've not harvested anything yet," he said.

John E. Steuri, assistant group executive of IBM's Information Systems Group, attempted to dispel rumors that the firm was unhappy in its relationship with Hogan. He said IBM's year-long sales and marketing reorganization did not delay its efforts to get the banking applications to market, nor was IBM contemplating replacing Hogan.

In fact, Steuri said, IBM is beginning to assess future banking-system customer requirements with Hogan. "An enhanced product plan has been drafted and is currently being sized by Hogan, who will be our primary developer for the enhancements," he explained. "Additional applications are being sized as well as MVS/XA and DB2 support, consistent with IBM's Systems Application Architecture direction."

AT&T to make super chips for Pentagon

READING, Pa. — AT&T last week won a contract said to be worth between $19.8 million and $30 million from the U.S. Defense Advanced Research Projects Agency for experimental production of advanced gallium-arsenide integrated circuits.

The Pentagon reportedly wants to use gallium-arsenide chips for its computerized weapons systems because they process faster, use less power and are more resistant to radiation than silicon chips. With the four-year contract, AT&T will establish a pilot production line for gallium-arsenide chips that are faster and more complex than those produced today.

The chips will contain between 3,000 and 5,000 logic gates per chip and operate in the 200- to 400-MHz range, AT&T said. Robert Vehse, project manager, said the challenge will be to develop production techniques that produce acceptable yields of the high-performance chips.

The manufacturing of gallium-arsenide chips has been a slow, costly process, but AT&T plans to "jump way ahead of the learning curve" by using production methods already perfected for silicon chips, Vehse said.

Aspen stock swap

CONTINUED FROM PAGE 83

I480 tape drive for the IBM 3480-compatible tape drive market.

Aweida Systems is an OEM marketing and distribution arm for Aspen and markets such products as disk subsystems from Hitachi Ltd.

The merger combines several former executives and founders from Storage Technology in addition to Aweida.

Louisville, Colo.-based Storage Technology now competes with Aspen Peripherals in the 3480-compatible market.

Under the agreement, Aweida, a Storage Technology founder and the president and chairman of Aweida Systems, assumes those positions with the merged companies.

Aweida left Storage Technology in 1984 at the time the company began restructuring under Chapter 11 of the Federal Bankruptcy Code and later formed Aweida Systems.

Aweida replaced Lundell

Aweida replaced Donald Lundell, who resigned from Aspen Peripherals several weeks ago as a result of disagreements with management, sources said.

In addition, Ron Vitullo, a 15-year veteran of Storage Technology and former vice-president of Aspen, returned to Aspen Peripherals in that capacity several weeks ago.

Sources said Vitullo left Aspen Peripherals after differences arose with its board of directors, but this could not be confirmed.

Jim McGuire, Aweida Systems' executive vice-president and a former Storage Technology marketing executive, has been named executive vice-president for Aspen Peripherals.

A spokesman for Aspen denied that the amount of former Storage Technology management running Aspen Peripherals would give the newly merged companies an unfair edge over one of its competitors.

IBM largest competitor

"Although Storage Technology is a significant competitor of ours, the important thing for us to understand is how IBM works," said Alan Kenney, Aspen's general counsel, adding that IBM is Aspen's largest competitor.

Aweida showed "a great capacity for leading Storage Technology to the frontier and if he can duplicate that, then Aspen Peripherials really will raise the competition for Storage Technology," according to Michael Martin, an analyst with Boettcher & Co., a Denver-based consulting firm.

The two private companies are not planning to go public, according to Kenney, although he said that was the firm's "long-run intention."

The combined companies have about 100 employees and will maintain administrative offices in Boulder, Colo., with engineering and manufacturing in Longmont.

Cincom sheds

CONTINUED FROM PAGE 83

up to a mix of products to run on systems from Digital Equipment Corp. and Wang Laboratories, Inc. The company has been developing DEC-compatible products since 1978, but with the growth of distributed DEC systems, Cincom decided to formalize its commitment to DEC.

In addition, the company is evaluating the development of products compatible with Unix as well as systems made by Honeywell Bull, Inc. and NCR Corp.

Today, roughly 80% of Cincom's business comes from the IBM-compatible arena, while 10% to 15% comes from a growing array of products based on DEC VMS. Cincom says its support of DEC should accelerate in coming years.

"Users are going to have multiple IBM data bases and multiple DEC data bases, as well as the need to distribute data between the two," Hank says.

The Supra relational DBMS will allow applications developed under IBM's MVS, for example, to run under DEC's VMS operating system, Hank says.

"Any application written for IBM will run on a VAX with 100%," says Thomas R. McLean, Cincom's vice-president of marketing and product planning.

Standing in DEC, IBM shadows

Cincom says its corporate stance will lie somewhere between the shadows of the two largest vendors on the block, IBM and DEC.

Cincom says it is putting customers in control of their networks by allowing them to move critical applications as they reconfigure their distributed systems. "We're not pro-IBM or pro-DEC," Hank insists. "We're pro-user."

In the future, Yablonsky says, Cincom will be more market-driven, and product lines will be customized for applications in vertical markets including insurance, hospital, manufacturing, financial and government. To ease this marketing change, Cincom has decided to provide a thorough management-training program for the several hundred managers in its 1,400-employee organization.

The past few years of growth have been difficult at times, Yablonsky acknowledges. "It's kind of like going through the sound barrier. We struggled through that, and found that growth required formal procedures and systems. Now we're on the other side of that learning curve, and we believe we have the infrastructure in place to handle up to $200 million in sales a year."

Shade of blue

FROM PAGE 83

• At Rolm Corp., a tighter IBM rein on the sales force and the replacement of President Dennis Paboojian with 25-year True Blue-er Ray AbuZayyad. So much for "intrapreneurship."
• Vice-Chairman and old-liner Paul Rizzo announces retirement; Kaspar Cassani and Jack Kuehler move up. The last of the John Opel men departs.
• A new DB2. Not actually announced yet, but expected this summer [CW, April 13]. More ulcers for salesmen from Software AG of North America, Inc., Cullinet Software, Inc. and Applied Data Research, Inc.
• System/36, VM-based Solution Pacs and stepped-up deliveries of the 9370; more cleaning up, and shoring up, mid-range marketing.
• Further hints, particularly in Europe, of a real commitment to at least some parts of the Open Systems Interconnect protocol model.

Quite a handful. Taken together, IBM's announcements clearly show how much the world has changed and how much IBM is willing to, or has to, change with it.

Not very long ago, the IBM world was relatively simple. While taking orders and hefty profit margins on, say, 3080s and 4300s, IBM could look in its crystal ball and see $100 billion in annual revenue by the end of the decade.

Just for fun, it sent Phil Estridge down to Boca Raton, Fla., to see what he could do with a curious novelty called a microcomputer . . . and another market was cornered. Profits hummed along, and a Republican Department of Justice decided big computer monopolies were not so bad after all. Furthermore, there was plenty of room for third-party servicers and lessors to prosper by riding the IBM wave.

Today, a different world

This month, Akers and his charges see a very different world. The company has essentially admitted it has not been fast enough, responsive enough or lean enough to prosper — at traditional IBM profit levels — in the world of networking, distributed computing and severe pricing pressure.

In 1985, IBM and the entire mainframe industry saw business start to slip; IBM called it a down cycle and attributed it to lower capital spending, a strong U.S. dollar and various other macroeconomic forces. In 1986, better known as the year of DEC, Big Blue realized that it had to change. While implementing a cost-reduction plan of unprecedented scope, it stepped back and took a hard look at the way it did business.

What the industry has seen in IBM's announcements this year are the results of those decisions. More notable as strategic future directions than actual products, IBM's recent moves show a company that, 1) will compete toe-to-toe with third-party companies that have undersold it for years; 2) will exercise tight control on all of its business units; and 3) will attempt to promulgate a new semiproprietary standard in corporate microcomputing.

Clearly, this is just the beginning. Rather than resisting industry forces as it has in the past, IBM will continue to change and map new strategic directions.

The ultimate results for Big Blue, its users and competitors remain to be seen. It is true that an elephant takes a long time to turn itself around. But once it does, its momentum can be very powerful.

Wilder is *Computerworld's* senior editor, computer industry.

Firms merge to win power in Unix mart

BY JAMES A. MARTIN
CW STAFF

SAN JOSE, Calif. — Unix-based systems vendors Arete Systems Corp. and Plexus Computers, Inc. announced last week their intent to merge in an effort to gain a stronger position in the Unix marketplace.

The merger will be accomplished with an exchange of privately held stock, although the amount of the merger was not disclosed.

The combined companies will be known as Plexus Computers, Inc., with a combined revenue of $65 million in 1986. The merger will combine Arete's strengths as an OEM with Plexus's end-user and value-added reseller channels.

Arete manufactures a series of multiuser, multiprogramming Unix-based workstations based on the Motorola, Inc. MC68000 series of microprocessors and supports up to 256 users. Plexus, founded in 1980, is said to be the first commercial supplier of Unix-based systems. The merger increases the breadth of Unix-based products the two firms can offer their combined installed base of some 3,500.

Vendors

FROM PAGE 83

of $110.2 million, or $1.71 per share, for its first quarter ended March 31.

"Their revenues were above our expectations," analyst Labe of Drexel Burnham said. "Their computer orders were up in March, which is pretty good considering they've reorganized their marketing worldwide in the last few months."

Last quarter, the company reported a substantial loss because of charges from merger-related asset sales, write-downs, plant consolidations and work force reductions.

Amdahl Corp. For its first quarter, the Sunnyvale, Calif.-based developer and manufacturer of large-scale systems reported $318.5 million in sales and profits of $25.2 million, or 51 cents a share. In the first quarter of 1986, sales were $200.2 million and earnings $2.4 million, or 5 cents a share.

Analyst Steven Milunovich of First Boston Corp. said Amdahl had a "better quarter than Wall Street expected" because of volume shipments of the 5890 mainframe line and 6380E double-capacity disk storage system. "Last year, they were selling older products; now, they've got two new products shipping in volume," he added.

The analyst said that in the long term he believes the company's growth will have to moderate, "to more closely resemble the underlying demand for mainframes and disk drives, which is growing certainly a lot less than [Amdahl's] revenues have been growing recently."

Data General Corp. Westboro, Mass.-based DG missed the industry upswing and posted an operating loss of $9.6 million, or 36 cents per share, for its second quarter, compared with income of $2 million, or 8 cents per share, for the same period last year.

The company also reported an extraordinary charge of $18.2 million, or 68 cents per share, resulting from its early redemption of debt, and a one-time loss of $14.8 million, or 55 cents per share, resulting from the write-down of its investment in an unconsolidated affiliate, Chapter 11-bound Dama Communications Corp. DG's loss for the quarter, including the nonrecurring items, was $42.6 million, or $1.59 per share.

Sales for the period were $315.2 million, compared with sales in the second quarter of 1986 of $318.8 million.

Apollo Computer, Inc. The workstation manufacturer attributed its 50% rise in sales in the first quarter to advanced product developments and technological enhancements, including its Network Computing System, introduced during the quarter.

For the period, Chelmsford, Mass.-based Apollo had earnings of $6.4 million, or 18 cents per share, on sales of $123.4 million. In last year's first quarter, earnings were $539,000, or 2 cents a share, on sales of $82 million.

Stratus Computer, Inc. Stratus President William Foster credited a 39% hike in sales to early market acceptance of the XA2000 systems, which accounted for 75% of product sales in the quarter.

For the period, sales were $37.4 million, up from the previous year's first-quarter sales of $26.9 million.

Earnings and earnings per share for the quarter were $3.7 million and 19 cents, respectively, compared with $3.05 million and 16 cents for the same period last year.

> AMDAHL'S growth will have to moderate, "to more closely resemble the underlying demand for mainframes and disk drives."
>
> STEVEN MILUNOVICH
> FIRST BOSTON CORP.

Computervision Corp. Sales for the Bedford, Mass.-based company's first quarter climbed 24% to $139.8 million, compared with $112.9 million a year ago.

Income for the period was $5.8 million, or 20 cents per share, compared with a loss of $7 million, or 24 cents per share, a year ago. The income included a $4.7 million gain from the sale of Sun Microsystems, Inc. stock.

Tandy Corp. Consolidated sales and operating revenue for the third quarter of Tandy's year were $776.9 million, an increase of 12% from 1986 sales of $693.4 million.

Income for the period rose 20%, to $50.4 million, from $42 million in the same quarter last year. Per-share earnings increased 19% to 56 cents, compared with 47 cents last year.

Ungermann-Bass, Inc. Despite a decline in sales to OEM and industrial networking customers, profits increased 50% to 1.2 million, or 7 cents per share. Revenue for the firm was $31.2 million, up from $26.1 million.

Software Publishing Corp. A 334% increase in income and a 91% increase in sales from last year's second quarter were recorded for the Mountain View, Calif.-based business software supplier.

For the period, earnings of $1.6 million, or 21 cents per share, were realized on sales of $10.9 million. In the like quarter last year, earnings were $365,000, or 5 cents per share, on sales of $5.7 million.

Texas Instruments, Inc. Sales for the electronics giant's first quarter were up 11% to $1.3 million, from the $1.15 million in sales recorded for the like period in 1986.

Earnings for the period were $83.8 million, or $2.77 per share, before extraordinary items, which compares with last year's first-quarter loss of $23.8 million, or 55 cents per share, before extraordinary items, the company said.

Britton Lee, Inc. The Los Gatos, Calif.-based manufacturer of relational data base management machines posted a loss on lower net sales for its first quarter, ended March 31.

For the period, Britton Lee had sales of $5.7 million, a decrease of 21% compared with the $7.2 million reported in the like quarter last year. The net loss was $1.9 million, or 24 cents per share, compared with income of $189,000, or 2 cents per share, in the 1986 period.

"Increases in systems and service revenue per customer sale appear to be extending sales cycles, resulting in less predictable quarter-to-quarter results," said David Britton, president of the company.

MCI Communications Corp. For its quarter ended March 31, MCI announced sales were up 3% to $955 million and reported income was $25 million, or 9 cents per share. For the similar period last year, sales were $920 million, with a loss of $502 million, or 8 cents per share. Income for the most recent period includes a pretax gain of $12 million from previously negotiated antitrust settlements. Sales increased approximately 4% from the December-to-March quarter, despite a March 1 rate reduction of approximately 9%, the company said.

Paradyne Corp. For its first quarter, Paradyne recorded sales of $55.9 million, down 15% from sales of $66 million in the first quarter of 1986.

For the period, the data communications equipment manufacturer posted a loss of $1.9 million, or 8 cents per share, which included a $723,000 extraordinary credit of 3 cents per share as a result of tax benefits from previous losses. The loss compares with income of $875,000, or 4 cents per share, including a 1 cent per share extraordinary tax credit for the comparable 1986 period.

Electronic Data Systems Corp. The Dallas-based computer services company registered a 16% increase in income, from $55.6 million, or 46 cents per share, to $64.6 million, or 53 cents per share, for its first quarter. Sales rose 4% from $997 million a year ago to $1.04 billion.

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Choosing freedom over salary

Schools offer more research opportunities but lower pay than industry

BY ROSE MULA
SPECIAL TO CW

Though computer scientists generally fare well in industry, many eventually become disenchanted with the price of their success — namely, the lack of freedom to pursue their own research projects.

"In industry, you have to work on whatever government contract or other business your company is involved with, whether or not it is of any interest to you," says Dean Paul Callaghan of Northeastern University's College of Computer Science in Boston. "Those kinds of restraints get to you after a while. I know — I was in the private sector myself for 10 years before coming here."

Approximately one-third of Northeastern's computer science faculty made the transition from business to the classroom, Callaghan says. Typically, Northeastern's faculty members already had earned Ph.D.s before they left private industry, and many were conducting research for leading computer companies.

In addition to the limitations of business, the uncertain business climate in the computer industry is also forcing many MIS professionals into academia.

"Many companies — IBM for one — are helping employees who are laid off or early retired find other careers, including teaching," says Dan Cougar, distinguished professor of computer and management science at the University of Colorado. "However, I don't see any indication of people with solid jobs leaving them to go into teaching, though they may teach on a part-time basis, in addition to their positions in industry." Accredited institutions are allowed to employ part-timers to fill 20% of their faculty requirements, he adds.

Money is the main reason many people do not leave industry for teaching, Cougar says. "The salaries are nowhere near comparable, even considering the shorter work year in academia," he adds.

However, computer professionals who teach can also augment their income by consulting. "Most universities allow professors to consult one day a week, and deans encourage them to do so, since they realize it's the only way they can hope to attract and hold qualified teachers," Cougar says.

Consulting does more than add merely a small amount to the salary, Callaghan says. Professors who choose to do private consulting one day a week and during semester vacations can add enough to their teaching salaries to equal what they might earn in industry. "Ninety thousand dollars a year is not out of the question for a top-notch professor/consultant," he adds.

Of course, it takes a while to reach that level. For that reason, Callaghan says, people with family responsibilities tend not to leave industry until they have bought a home and put their children through college. "They work in industry to finance their acquiring," he says. "Then they decide to come back to university life."

> "A YEAR AGO, there were 25 openings in academia for every holder of a Ph.D. looking for a job, and at least 15% to 20% of all faculty openings in computer science are unfilled."
>
> PAUL CALLAGHAN
> NORTHEASTERN UNIVERSITY

Schools are currently seeking professionals who hold Ph.D.s and have attained at least one high-level position in a leading company. "A year ago, there were 25 openings in academia for every holder of a Ph.D. looking for a job, and at least 15% to 20% of all faculty openings in computer science are unfilled," Callaghan says.

George Lucas, a former researcher with Bolt Beranek and Newman, Inc. and currently an associate professor of math and computer science at the University of Massachusetts/Boston, had no trouble making the switch to academia, mainly because he had a Ph.D.

"Though a doctorate is a necessity at the university level, it doesn't have to be in the particular discipline in which you are seeking a teaching position," Lucas says. "I'm teaching computer science, and my doctorate is in theoretical physics."

While a doctorate is almost always required of anyone seeking a professorship, occasional exceptions are made. Twenty percent of the faculty of an accredited institution can be non-Ph.D. holders. Most universities seeking computer science teachers are usually willing to consider someone who may not have a doctorate but who has an outstanding background as a high-level manager in industry.

MIS professionals who want to get into teaching but have neither an advanced degree nor a history of high-level management positions should investigate opportunities at large urban schools such as the City University of New York. This university offers various levels of computer study, and throughout its 19 campuses, many of these courses are taught by part-time teachers with various educational backgrounds.

"Because of the variety of our programs, we provide teaching opportunities even for those with only bachelor's degrees," says Donald Glickman, executive assistant to the vice-chancellor for faculty and staff relations. "But we like to see some evidence of progress toward a graduate degree."

Requirements for schools with a more specialized type of curriculum are more stringent. One such institution, the Milwaukee School of Engineering, concentrates on the integration of software and hardware. "Today, software is becoming very hardware-dependent," says Tom Davis, dean of academics and research. "Industry is desperately seeking people who have a thorough understanding of both — and we're desperately seeking teachers with industry experience in both."

Mula is a Waltham, Mass.-based freelance writer.

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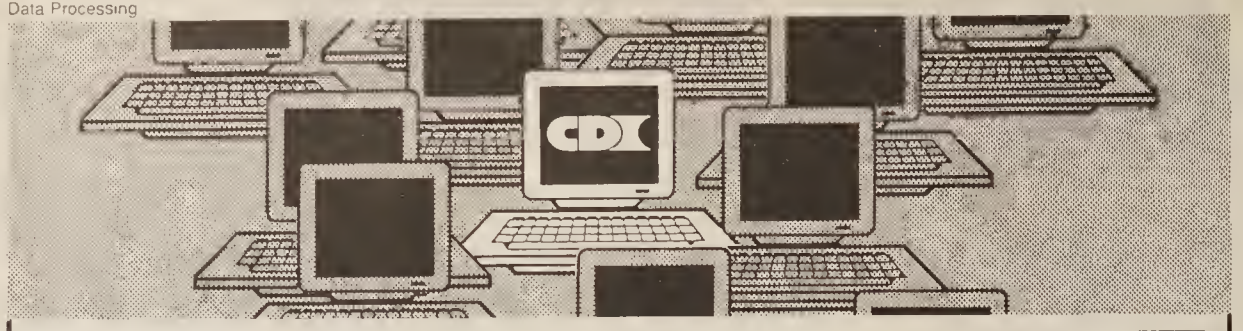

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Advanced Systems Division

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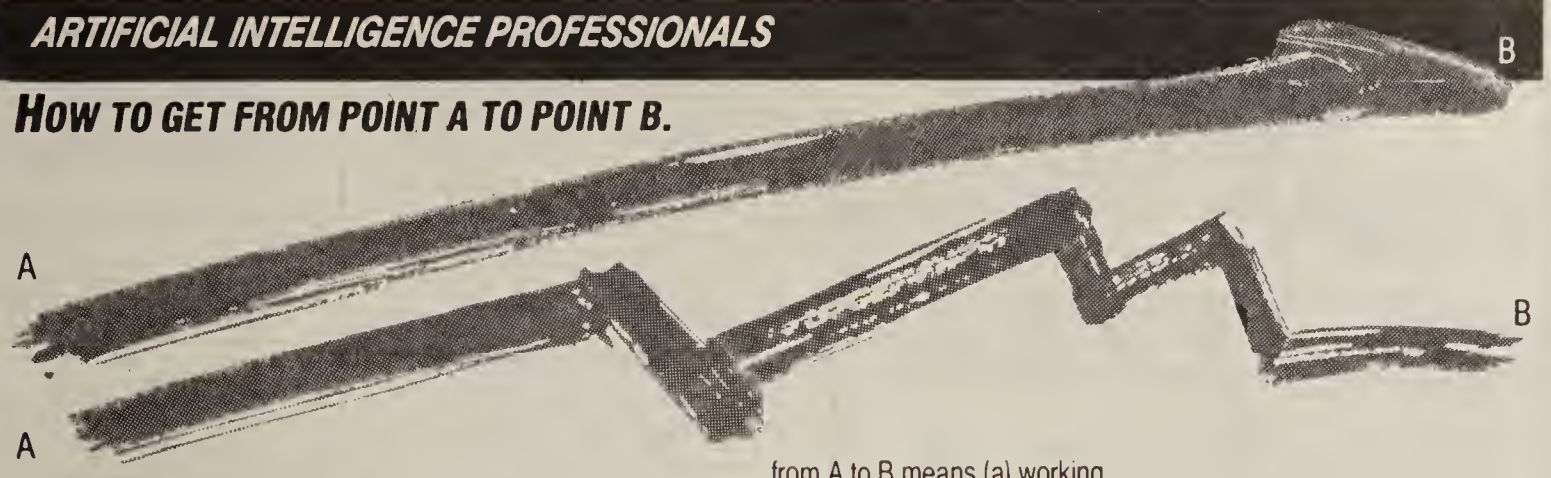

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University of Alberta, Edmonton, Alberta Canada

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•9375-40	0.3	8 to 16
4331-2	0.50	1 to 4
S/38-300	0.58	6 to 8
S/38-400	0.75	6 to 8
•9375-60	0.76	8 to 16
4341-1	0.88	2 to 4
S/38-600	0.98	8 to 16
S/38-700	1.1	16 to 32
4381-11	1.4	4 to 16
4361-5	1.45	2 to 12
4341-2	1.5	2 to 16
•9377-90	1.6	8 to 16
4341-12	1.65	2 to 16
4381-1	2.1	4 to 16
4381-2	2.7	4 to 32
4381-12	2.7	8 to 32
4381-13	3.8	8 to 32
3083EX	4.4	8 to 32
4381-3	4.5	8 to 32
3033UP	5.0	4 to 24
4381-14	6.0	16 to 32
3083BX	6.6	8 to 32
3083JX	8.8	8 to 32
3090-150	9.2	32 to 64
3081D	10.0	16 to 32
•3090-150E	10.0	32 to 64
3081GX	11.9	16 to 64
3090-180	15.4	32 to 64
3081KX	15.5	16 to 64
•3090-180E	17.6	32 to 64
3090-200	27.7	64 to 128
3084QX	28.7	32 to 128
•3090-200E	31.9	64 to 128
•3090-300E	44.3	64 to 128
3090-400	50.0	128 to 256
•3090-400E	56.0	128 to 256
•3090-600E	76.0	128 to 256

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5860	14.0	16 to 128
5867	22.0	24 to 128
5868	22.0	32 to 256
5870	26.6	32 to 128
5880	26.6	32 to 256
•5890-190E	22	64 to 256
•5890-200E	31	64 to 256
•5890-300E	40	64 to 256
•5890-400E	58	128 to 512
•5890-600E	67	128 to 512

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AS XL-80	50	64 to 256
•AS XL-90	67	128 to 512
•AS XL-100	80	128 to 512

The above information is intended as a guideline for computer users on relative computer systems instruction cycle times. All data have been derived from published documentation and represent reasonable estimates of average MIPS ratings. However, Randolph is not responsible for the accuracy of the MIPS data. Cycle times will vary based on hardware software configurations and system manufacturers continually modify computer models as design improvements in hardware and software arise.

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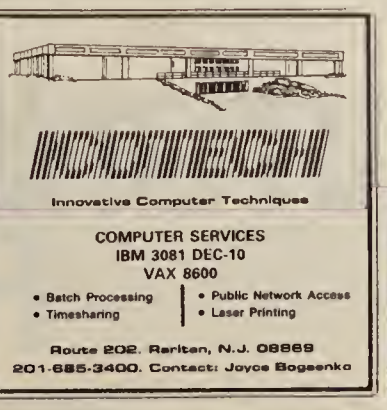

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June's *Computerworld Focus* will help our readers sort out this seemingly complex issue from start to finish. It'll discuss power conditioners for micros, minis, and mainframes . . . detail available product options . . . examine the growing value of fault-tolerant computing systems . . . look at the increasing importance of network security . . . and study how hundreds of other managers are successfully implementing data security systems. Plus—a special feature section will focus on disaster recovery.

Computerworld Focus puts you in touch with a powerful audience of MIS professionals involved in a market which spends over $120 billion annually. You'll reach our paid circulation of over 127,000 subscribers as well as thousands of pass-along readers. Plus, bonus distribution of the June *Focus* issue at NCC '87 in Chicago will put you in touch with thousands more.

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Micro-to-mainframe security issues. A look at what can happen when uploading and downloading from PCs to mainframes and how to best safeguard data base information.

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Security devices. A product guide on assessing security requirements and determining the most appropriate hardware and software options.

Fault-tolerant computing systems. A look at how companies needing non-stop computing are turning to fault-tolerant systems regardless of the cost.

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Plus coverage of: what role security should play in the overall MIS plan, and how network security is becoming an integral component of every security plan— and more.

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A CWCI Publication
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June 8	LANs	May 22
June 22	Printers — Line & Character	June 5
June 29	Accounting Software	June 12
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July 20	Accounting & Financial Software	July 3
August 3	Communications Software	July 17

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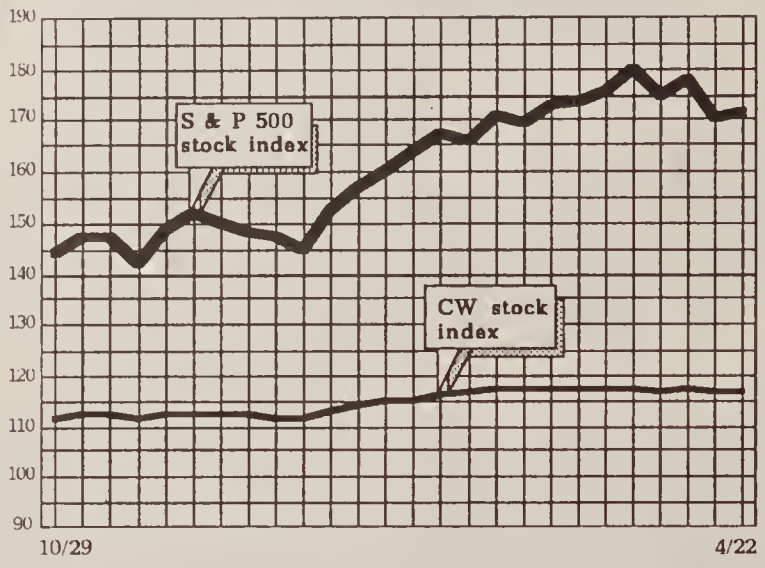

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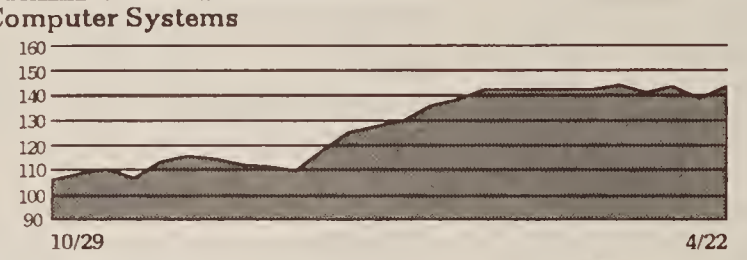
Computer Systems



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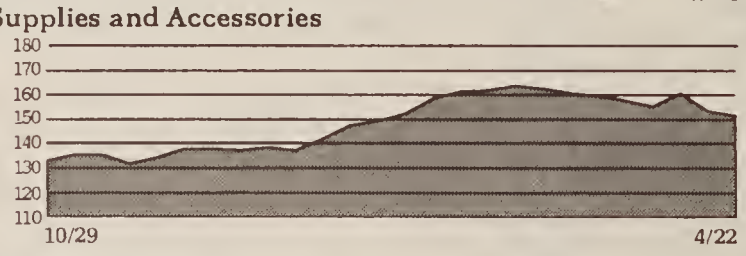

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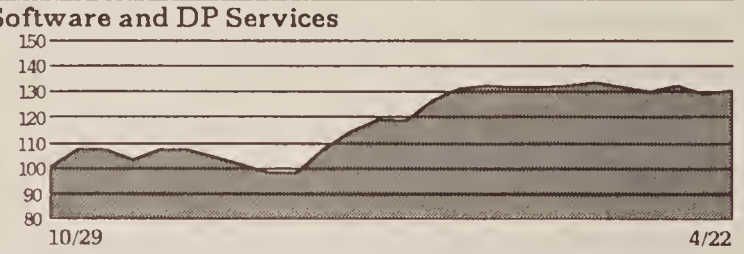

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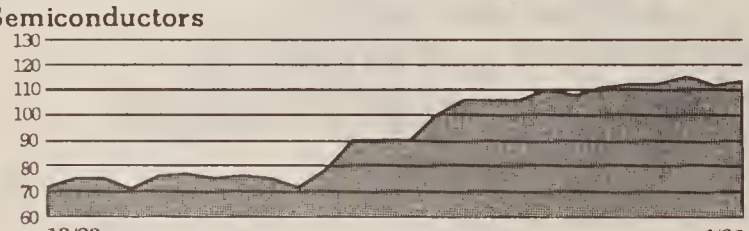

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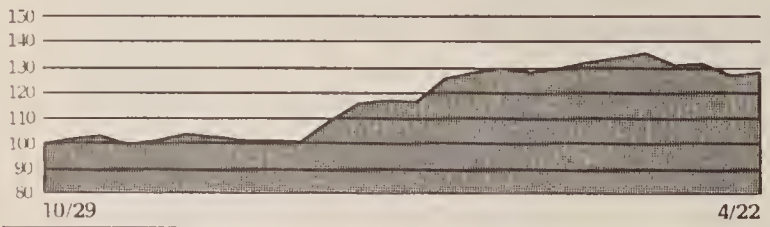

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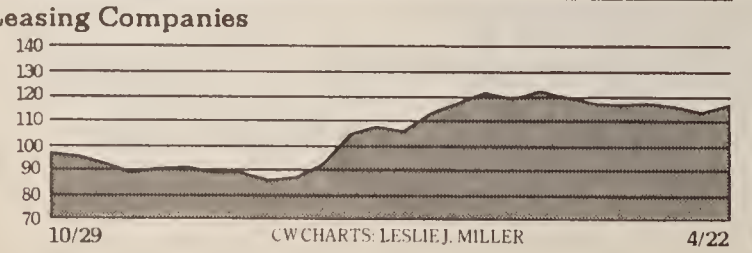

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CLOSING PRICES WEDNESDAY, APRIL 22, 1987

O-T-C PRICES ARE BID PRICES AS OF 3 P.M. OR LAST BID
(1) TO NEAREST DOLLAR

EXCH		52-WEEK RANGE (1)		PRICE CLOSE APRIL 22 1987	WEEK NET CHNGE	WEEK PCT CHNGE
Computer Systems						
O	ALPHA MICROSYSTEMS	7	4	4.63	+0.4	+8.8
O	ALTOS COMPUTER SYS	19	10	12.75	+0.8	+6.3
A	AMDAHL CORP	41	15	39.63	+2.1	+5.7
O	APOLLO COMPUTER INC	23	9	19.38	+1.9	+10.7
O	APPLE COMPUTER INC	77	27	74.25	+3.3	+4.6
N	AT&T	28	22	24.38	-0.4	-1.5
O	C P T CORP	6	3	4.00	+0.0	+0.0
N	COMPAQ COMPUTER CORP	35	12	31.50	+0.8	+2.4
A	COMPUTER CONSOLES INC	12	7	9.63	+0.3	+2.7
O	CONCURRENT COMP CORP	19	11	15.25	-0.5	-3.2
N	CONTROL 0ATA CORP	33	20	30.75	+0.4	+1.2
O	CONVERGENT TECH	12	4	6.50	-0.1	-1.9
N	CRAY RESH INC	136	69	132.00	+4.8	+3.7
O	DAISY SYS CORP	14	8	9.63	-0.1	-1.3
N	DATA GEN CORP	45	25	30.88	+0.5	+1.6
N	DATAPOINT CORP	9	4	5.00	+0.1	+2.6
N	DIGITAL EQUIP CORP	173	81	164.75	+3.5	+2.2
N	FLOATING POINT SYS INC	46	11	12.38	-0.1	-1.0
N	GOULD INC	28	15	17.13	-0.1	-0.7
N	HARRIS CORP	41	27	39.88	+1.8	+4.6
N	HEWLETT PACKARD CO	63	36	54.88	+1.4	+2.6
N	HONEYWELL INC	84	58	78.50	+4.3	+5.7
N	I8M	162	116	154.25	+3.4	+2.2
O	IPL SYS INC	4	2	2.88	+0.1	+4.5
N	ITT CORP	66	44	56.63	+0.6	+1.1
N	M A COM INC	18	12	14.25	+0.3	+1.8
N	MATSUSHITA ELEC INDL LTD	136	77	108.00	+11.3	+11.6
O	MENTOR GRAPHICS CORP	31	11	30.00	+3.5	+13.2
N	NBI INC	14	8	10.63	+0.4	+3.7
N	NCR CORP	73	42	71.38	+4.6	+6.9
N	PRIME COMPUTER INC	27	16	26.50	+3.1	+13.4
O	STRATUS COMPUTER	38	18	36.75	+1.5	+4.3
O	SYM8OLICS INC	15	4	5.00	-0.1	-2.4
O	TANDEM COMPUTERS INC	75	28	73.75	+0.0	+0.0
N	TANDY CORP	56	31	46.25	+1.0	+2.2
N	TEXAS INSTRS INC	203	103	190.50	-4.8	-2.4
A	ULTIMATE CORP	35	13	20.13	+0.1	+0.6
N	UNISYS CORP	120	58	116.50	+13.6	+13.2
A	WANG LA8S INC - B	20	11	16.75	+0.8	+4.7
A	WANG LA8S INC - C	20	11	17.38	+2.3	+14.9
N	XEROX CORP	78	49	76.63	+3.3	+4.4
Supplies & Accessories						
N	AMER BUSINESS PRODS	37	23	29.50	-0.1	-0.4
N	8ARRY WRIGHT CORP	24	14	18.38	+0.1	+0.7
A	0UPLEX PROOS INC	23	18	19.00	-1.0	-5.0
N	ENNIS BUSINESS FORMS INC	23	14	20.00	-0.5	-2.4
N	3M CO	140	98	126.38	-0.1	-0.1
N	MOORE LTD	28	20	24.75	+0.0	+0.0
O	STANDARD REGISTER CO	53	32	47.50	+0.5	+1.1
N	WALLACE COMPUTER SVCS	50	37	45.38	+0.4	+0.8
Software & DP Services						
O	ADVANCE0 COMP TECH	7	3	4.50	+0.0	+0.0
N	ADVANCE0 SYS INC	22	12	19.13	-1.0	-5.0
N	AGS COMPUTERS INC	40	17	38.00	+3.3	+9.4
O	AMERICAN MGMT SYS INC	36	13	35.50	+4.0	+12.7
O	AMERICAN SOFTWARE INC	22	7	17.38	-1.6	-8.6
N	ANACOMP INC	8	3	7.88	+0.5	+6.8
O	ANALYSTS INTL CORP	11	4	10.25	+0.5	+5.1
O	ASHTON TATE	30	10	23.75	-0.5	-2.1
O	ASK COMPUTER SYS INC	17	9	14.38	-0.6	-4.2
O	ASTRADYNE COMP IND	3	1	1.31	+0.1	+5.0
N	AUTOMATIC DATA PROC	51	29	48.50	+3.0	+6.6
O	8OOLE & BAB8AGE INC	11	4	9.25	+0.0	+0.0
N	COMPUTER ASSOC INTL INC	48	20	42.63	-0.5	-1.2
O	COMPUTER HORIZONS CORP	15	10	12.13	-0.9	-6.7
O	COMPUTER NETWORK TECH	10	4	4.81	-0.1	-1.3
N	COMPUTER SCIENCES CORP	61	30	57.75	+0.0	+0.0
N	COMPUTER TASK GROUP INC	19	11	16.50	+1.5	+10.0
O	COMSHARE INC	18	11	16.25	+0.0	+0.0
N	CULLINET SOFTWARE INC	16	6	11.50	+0.9	+8.2
O	CYCARE SYS INC	17	7	8.88	+0.0	+0.0
O	DUQUESNE SYS INC	33	12	31.50	+1.5	+5.0
N	GENERAL ELEC CO	113	71	103.88	-1.6	-1.5
N	GENERAL MTRS CORP (CLASS E)	50	24	37.00	+0.3	+0.7
O	HOGAN SYS INC	17	8	16.38	+1.1	+7.4
O	INFORMATION SCIENCES INC	4	1	1.25	+0.0	+0.0
O	INFOTRON SYS CORP	17	7	8.75	-0.3	-2.8
O	KEANE INC	16	5	8.75	+0.5	+6.1
N	LOGICON INC	38	22	24.63	-0.5	-2.0
O	LOTUS DEV CORP	28	9	26.00	+0.0	+0.0
O	MANAGEMENT SCI AMER	21	12	14.50	-1.3	-7.9
O	MCI COMM CORP	11	5	6.25	-0.4	-5.7
O	MICOM SYS INC	18	10	15.38	+0.8	+5.1
O	MICRO PRO INTL CORP	6	2	5.19	+0.3	+6.4
N	MICROSOFT CORP	101	26	98.50	+2.5	+2.6
O	NATIONAL DATA CORP	27	16	23.25	-0.3	-1.1
O	ON LINE SOFTWARE INT	24	10	22.50	+0.0	+0.0
O	ORACLE SYS CORP	29	7	24.50	+1.3	+5.4
N	PANSOPHIC SYS INC	21	12	19.25	+0.1	+0.7
O	POLICY MGMT SYS CORP	30	15	25.50	-2.0	-7.3
O	PROGRAMMING & SYS INC	13	8	10.50	+0.0	+0.0
O	REYNOLDS & REYNOLDS CO	42	27	33.50	+0.0	+0.0
O	SCIENTIFIC COMPUTERS INC	8	4	7.88	+0.1	+1.6
O	SEI CORP	31	15	28.25	+2.0	+7.6
O	SHARED MED SYS CORP	53	29	31.00	+1.4	+4.6
O	SOFTWARE AG SYSTEMS INC	22	10	13.00	+0.4	+3.0
O	SOFTWARE PUBG CORP	16	5	16.00	+2.0	+14.3
A	STERLING SOFTWARE INC	21	10	10.75	-0.1	-1.1
N	SUNGUARD DATA SYSTEMS	20	10	17.00	-0.8	-4.2
N	UCCEL CORP	36	18	31.00	+0.4	+1.2
N	URS CORP	21	13	18.88	-0.3	-1.3
O	VM SOFTWARE INC	45	16	36.50	-3.5	-8.8
Semiconductors						
N	ADVANCED MICRO DEV	32	13	20.63	+0.3	+1.2
N	ANALOG DEVICES INC	25	14	20.50	+0.0	+0.0
O	ANALOGIC CORP	14	10	11.25	-1.1	-9.1
N	APPLIED MAGNETICS CORP	36	13	33.50	+1.6	+5.1
O	AVANTEK INC	23	14	15.38	+0.4	+2.5
O	HADCO CORP	7	3	5.38	-0.1	-2.3
O	INTEL CORP	46	16	43.50	+2.0	+4.8
O	MICRO MASK INC	7	2	5.88	+0.0	+0.0
N	MOTOROLA INC	60	34	58.88	+4.4	+8.0
N	NATIONAL SEMICONDUCTOR	17	8	15.25	+0.8	+5.2
N	TERADYNE INC	30	16	24.75	+1.8	+7.6

EXCH		52-WEEK RANGE (1)		PRICE CLOSE APRIL 22 1987	WEEK NET CHNGE	WEEK PCT CHNGE
Peripherals & Subsystems						
A	AM INTL INC	9	5	7.38	+0.6	+9.3
A	ANDERSON JACOBSON INC	4	1	2.38	-0.1	-5.0
O	AST RESH INC	23	11	17.00	+0.5	+3.0
O	AUTOTROL CORP	10	5	8.25	-0.3	-2.9
O	AVANT GARDE COMPUTING	7	3	3.88	+0.1	+3.3
O	8ANCTEC INC	14	6	14.00	+0.5	+3.7
N	8OLT BERANEK & NEWMAN	60	37	47.50	-0.5	-1.0
A	CETEC CORP	9	5	5.38	-0.3	-4.4
A	COGNITRONICS CORP	6	2	3.25	+0.0	+0.0
N	COMPUGRAPHIC CORP	24	16	20.75	-0.5	-2.4
N	COMPUTERVISION CORP	23	10	19.00	+1.0	+5.6
N	CONRAC CORP	30	12	27.50	-1.6	-5.6
A	DATAPROOUCTS CORP	18	11	13.00	+0.9	+7.2
A	DATARAM CORP	18	7	7.63	-0.1	-1.6
O	DATA SWITCH CORP	9	5	6.63	+0.6	+10.4
O	DATUM INC	7	4	5.38	-0.1	-2.3
N	DECISION INDS CORP	15	7	7.38	+0.0	+0.0
O	ENDATA INC	9	5	9.00	+0.6	+7.5
O	EMC CORP	34	11	24.00	-0.3	-1.0
O	EVANS & SUTHERLAND	40	20	33.50	+1.5	+4.7
N	FLOATING POINT SYS INC	46	11	12.38	-0.1	-1.0
O	GANDALF TECHNOLOGIES	11	5	9.50	-0.3	-2.6
N	GENERAL 0ATACOMM IND	15	8	11.00	-0.5	-4.3
O	ICOT CORP	13	5	5.88	+0.3	+4.4
O	INFORMATION INTL INC	18	13	15.50	+0.8	+5.1
O	INTERLEAF INC	16	8	14.63	+0.4	+2.6
O	MEGADATA CORP	7	2	4.88	-0.3	-4.9
A	MSI DATA CORP	17	10	15.63	-0.1	-0.8
N	NASHUA CORP	31	21	28.88	+0.4	+1.3
O	NETWORK SYS CORP	19	11	13.88	-0.4	-2.6
N	NORTH AMERN PHILIPS CORP	47	35	39.25	-0.1	-0.3
N	NORTHERN TELECOM LTD	46	27	42.38	-0.6	-1.5
O	NOVELL INC	26	9	22.25	-1.0	-4.3
N	PARADYNE CORP	11	4	5.88	-0.1	-2.1
A	PENRIL CORP	8	4	5.25	+0.0	+0.0
N	PLESSEY PLC	41	24	38.38	+1.1	+3.0
O	PRINTRONIX INC	14	10	11.50	+0.4	+3.4
N	QMS INC	18	11	12.38	-0.5	-3.9
O	RAMTEK CORP	7	4	4.88	+0.1	+2.6
N	RECOGNITION EQUIP INC	27	10	19.75	-0.3	-1.3
O	SCAN TRON CORP	19	11	12.50	+0.8	+6.4
N	SCIENTIFIC ATLANTA INC	18	9	16.50	-0.3	-1.5
O	SEAGATE TECHNOLOGY	42	10	36.00	+1.5	+4.3
N	STORAGE TECHNOLOGY	5	2	3.88	-0.1	-3.1
O	SUN MICROSYSTEM INC	35	11	33.50	+4.0	+13.6
A	T-BAR INC	8	5	8.00	+0.1	+1.6
A	TAB PRODS CO	21	12	18.13	-0.4	-2.0
O	TANOON CORP	8	2	5.25	-0.3	-4.5
A	TEC INC	6	3	3.25	+0.0	+0.0
N	TEKTRONIX INC	43	27	33.25	-1.3	-3.6
O	TELEVIDEO SYS INC	4	2	3.00	+0.0	+0.0
N	TELEX CORP	102	52	74.25	-1.5	-2.0
N	TIMEPLEX INC	41	14	36.13	+2.5	+7.4
N	TITAN CORP	11	6	6.75	-0.3	-3.6
O	WYSE TECH	30	13	25.75	+1.9	+7.9
Leasing Companies						
N	COMDISCO INC	31	15	30.00	+0.5	+1.7
N	CONTINENTAL INFO SYS	14	7	12.00	+0.0	+0.0
O	FINALCO GROUP INC	4	2	2.88	+0.0	+0.0
O	PHOENIX AMERN INC	8	3	6.00	+0.8	+14.3
O	SELECTERM INC	12	5	4.75	+0.0	+0.0
N	U.S. LEASING	52	38	49.75	+0.6	+1.3

EXCH: N = NEW YORK; A = AMERICAN; P = PACIFIC; B = BOSTON; L = NATIONAL; M = MIDWEST; O = OVER-THE-COUNTER; S = SPLIT

Apple stock to split

IBM, DEC post gains; Prime boasts 25% rise in two weeks

While the overall stock market moves up and down like a yo-yo, computer stocks, in general, continue to perform well.

The industry's second straight week of encouraging first-quarter results helped boost most vendors' stock prices, while the Dow Jones industrial average followed a 66-point gain Tuesday with a 51-point nosedive Wednesday. The week's big stock news came from Apple Computer, Inc., which announced that it will split 2-for-1 when the company pays its first quarterly dividend June 15.

Apple was ripe for a split; it has been trading in the 70s after dropping as low as 27⅝ within the past year. It closed Thursday in over-the-counter trading at 76 points, up 4½ in the first four days last week.

IBM, buoyed by a seven-point surge in Tuesday's rally, closed Thursday up 4¼ points for the week to 154¼. Digital Equipment Corp. rebounded nicely from a big drop two weeks ago, gaining 8½ points to reach 165½. Prime Computer, Inc., which announced strong first-quarter earnings, jumped three points to 27⅜; the stock has risen by 25% in the past two weeks.

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MIS: Shift to 3½-in. disks slow, careful

Use of 5¼-in. floppies to continue indefinitely as managers deal with media compatibility issues

BY JEAN S. BOZMAN
CW STAFF

MIS managers at large corporations are planning to move to IBM's new 3½-in. Personal Computer diskette format gradually and are devising methods to continue using their existing 5¼-in. floppy disks indefinitely.

The strategies are intended to deal with some basic incompatibilities between the two storage formats, which in some cases prevent current PC programs from running on the new machines.

While impressed with Personal System/2's capabilities, MIS managers at more than a dozen large IBM shops said last week they are concerned about issues of media compatibility as well as the difficulty of maintaining multiple standards in the same shop.

The users, which include Aetna Life & Casualty Co., Texaco, Inc., Southland Corp., Mellon Bank Corp., Robert Bosch Corp. and Price Waterhouse, are all bringing a few sample models of the PS/2s in-house to run them through their paces before recommending volume orders. What users are looking for is evidence that older PC programs will not run smoothly on the new PS/2s — and for any problem in transferring data or programs to the new 3½-in. floppy diskette standard.

The companies are also trying to determine to what degree the PS/2's hardware differences with the older PCs, including different device drivers, will affect PC software performance.

"I don't want to be on the bleeding edge," said Ron McKee, data communications specialist at Robert Bosch Corp., a Maywood, Ill.,-based maker of auto parts.

There are a variety of methods to accomplish data and program migration to 3½-in. diskettes. IBM recommended four alternatives, but the conversion poses a considerable management issue, according to users.

"It's going to be a pain to change over the software for thousands of PCs," said Donald Smith, a Chicago partner at Price Waterhouse and the firm's national coordinator for microcomputer consulting. "We hate to go through it."

Wants 5¼-in. drive

Price Waterhouse, for one, said it wishes IBM had included a 5¼-in. drive on its new systems, allowing side-by-side use of older programs without the need for data migration.

Instead, users will have to follow IBM's recommendation that they buy an outboard 5¼-in. diskette drive for the PS/2s or add an inboard or outboard 3½-in. drive to their older IBM PCs or PC XTs. All of these options will allow PS/2 users to run old IBM programs or use data files created on the older PCs. However, many existing programs, including Lotus Development Corp.'s 1-2-3, will not run on the PS/2 without an upgrade supplied by the vendor (see story at right).

The actual data transfer can be accomplished through the use of IBM's Data Migration Facility, a $35 kit that allows users to send data or IBM programs from their older PC to the new PS/2. The migration aid uses printer cables and the parallel ports on the backplanes of both the older and newer PCs.

Another alternative is to downline load programs from a network file server to the new PS/2's 3½-in. diskette drive. All of the IBM-recommended methods are safe for the transfer of data or IBM programs, an IBM spokesman said.

"We've tested our [IBM] programs and have determined that they will work on the new media," IBM spokesman Cary Zeider said, "but we have not tested all IBM-compatible software, and users will have to check with their software vendors for compatibility."

Users cannot, for example, copy 1-2-3 from their XT to a PS/2 and run it unmodified. For one thing, 1-2-3 is copy-protected. Lotus also cautions that it cannot guarantee the performance of its 5¼-in. format software line on the PS/2.

Some users are electing to buy programs such as Copy II PC, a software package from Central Point Software in Portland, Ore., that will copy 1-2-3 and 200 other protected programs onto a nonprotected diskette. Central Point is beginning shipments this week of a new version of the Copy II PC program customized for the new PS/2 models, President Michael Brown said.

However, a Lotus spokeswoman said, "We would not advocate breaking the copy protection of our software packages."

Different approaches

With such a variety of options, large MIS shops are planning different approaches to the challenge of switching over to the 3½-in. medium. Price Waterhouse's Chicago office already maintains a software library for PCs that houses dozens of software programs. That central library will probably get IBM's Data Migration Facility, according to Price Waterhouse's Smith.

Other firms, such as Bosch, plan on installing outboard 5¼-in. diskette drives for the new systems and inboard 3½-in. disk drives on older PCs to allow programs to be copied to the new machines or to be used in the add-on disk drives. Bosch has already used this approach for its IBM-compatible laptop computers from Toshiba Corp., which use a 3½-in. diskette.

Doubts about the ease of conversion are causing some users to hold off on endorsing the PS/2. Ed McDonald, division manager for Texaco's Information Processing group in Houston, said he wants to test the new machines and the migration of data from the older PCs to the newer ones. "We want to know what the requirements are before we put the Personal System/2s on our recommended list," he said.

Lotus advises wait for new 1-2-3

Lotus Development Corp. is urging users of its popular 1-2-3 software to use a new 3½-in. diskette version of the package on IBM's Personal System/2 computers rather than run the program from an external 5¼-in. disk drive.

A Lotus spokeswoman said last week that the company could not vouch for the performance of 1-2-3 when it is run on 5¼-in. disk drives attached to the PS/2. "There are new device drivers in the new IBM [personal computers] which the 5¼-in. copies of 1-2-3 do not address," she said. "Our solution, available on the 3½-in. drives next month, will take full advantage of the Personal System/2's new features."

The spokeswoman added that not all of the company's products are slated to be available in the new format in the near future. New versions of Express, Symphony and Freelance will be available by the end of this month, but the spokeswoman would not commit to shipping dates for 3½-in. versions of other programs, including Human Access Language, Manuscript and Metro. They will be available "before the end of this year," she said.

Lotus said 1-2-3 cannot be transferred to 3½-in. disks using IBM's Data Migration Facility (see story above). "The IBM migration tools are just not compatible with copy-protected software like Lotus 1-2-3," the Lotus spokeswoman said last week. "Users can, however, migrate their Lotus 1-2-3 data files by using the IBM migration tools."

An exchange program will go into effect in May that allows users to trade in their 5¼-in. floppy diskettes of 1-2-3 for new 3½-in. ones. Lotus said it will charge $30 for the exchange..

JEAN S. BOZMAN

Model 50

FROM PAGE 1

The Model 50, so far, has not been a "barnburner" in terms of sales, Wagner said, although his stores have had a "reasonable" sales flow. "We will sell everything we get in. I expect it's going to be a pretty hot product," he added.

Ironically, the Model 50's limited expansion options are seen as a plus by some buyers. Matt Fitzsimmons, manager of a Computerland outlet in White Plains, N.Y., said Model 50 sales have been brisk. He said major corporations such as Pepsico, Inc. and General Foods, Inc. are buying Model 50s, in part because they cannot be expanded beyond 20M bytes, allowing the companies to set memory limits on desktop computing.

"If a user needs more than 20M bytes, [Pepsico and General Foods] think users should be dialing into the network or the mainframe and that they really don't need a micro," Fitzsimmons said. "They think the Model 50 is ideal for 90% of their users."

Considering Model 60

However, some MIS and micro managers said last week that the Model 50's slow disk access time, coupled with the inability to replace the drives with faster, less expensive ones from third-party suppliers, is forcing them to more seriously consider purchasing the Model 60.

"I would like to get [Model 50s] without the drives and put in my own, but I can't," said Robert Corr, director of strategic planning for Electronic Data Systems Corp. (EDS). "I think you would be crazy to buy it, and I think IBM was crazy to do it. What can I do with an 80-msec drive except make a paperweight out of it?"

Some MIS managers said IBM is using the Model 50 as a sort of "loss leader" to show the market that its PS/2 line is price competitive. Except for memory and disk drive expansion options, the Models 50 and 60 have the same features. However, the Model 50 is priced $1,700 less than the Model 60.

An IBM spokesman confirmed last week that corporate users cannot buy diskless Model 50s. He said IBM decided to use the 80-msec drives because it felt many of the customers who would use the Model 50 would find its disk speed acceptable.

"We looked at the performance levels required by customers, and taking into consideration variables such as the channel speed, disk caching and 1-to-1 interleaving, we thought the throughput was appropriate," said Jim Monahan, an IBM spokesman.

While some MIS managers admitted that the enhanced interleaving technology makes the Model 50 faster when doing sequential searches, they said it is not as efficient when moving track to track.

"If you're doing sequential I/O, the 1-to-1 interleave will buy you a lot. If you're doing a lot of random I/O with very small records, then it's going to be very slow for you — as slow as the IBM PC XT," said Julian Horwich, director of the Chicago Association for Microcomputer Professionals. Horwich admitted however, that he had not completed all of his scheduled benchmarks of the system.

EDS's Corr and two other MIS professionals interviewed last week said the inability to expand the memory capacity of the Model 50 is another liability. They said a machine with such a powerful chip should have perhaps as much as 40M bytes so it can accommodate personal as well as enterprise data.

"The Model 50 pricing is relatively low, but its limited growth path plus the hard disk is a curious thing," Horwich said.

Staff writer David Bright contributed to this report.

Service firms

FROM PAGE 1

market. "PCs are being used more and more throughout organizations, and mainframe sales are slowing," explains Rick Sherlund, a software specialist and vice-president of investment research for Goldman, Sachs & Co. in New York.

This proliferation of microcomputers also creates demand for host systems, particularly in the service sector. Sales of mainframes, however, will increase only 2.8% per year through 1991, according to International Data Corp. (IDC), a market research firm based in Framingham, Mass. PC growth may exceed 20%, analysts say.

For Mellon's DiNardo, the reasons to buy are simple: Important new applications and competitive pressures in the banking industry spur the need for more and more CPU cycles.

"In banking, the computer is the production machine," he observes. In fact, Mellon, which installed an IBM 3090 Model 400 in January, will have another in place by September, DiNardo says.

Better delivery is key

IDC estimates that the banking industry will increase systems spending by 6.6% through this year, the third fastest growing spending group. "The key for all these industries — [banking, finance and insurance] — is better delivery of information," says Marty Gruhn, vice-president of The Sierra Group, a Tempe, Ariz.-based research and consulting firm.

Both recently published and unpublished Sierra Group reports find that banking, finance and insurance are increasing computer spending for the same reason: to increase productivity.

This goal points to the service-sector firms' intense desire to remain competitive. In banking, much of the increased competition is the result of the deregulation that occurred in the late 1970s.

"Banking is expansionary at the moment. The new services being offered and new fields entered require a bigger and better hardware platform," says an executive with a large East Coast bank. Such deregulation is leading banks to compete for business by offering more services, such as faster turnaround on loans and mortgages, many of which require new software and CPU resources.

Pressures strain resources

Although insurance is still a regulated industry, competitive pressures and bolder customer demands are straining current computing resources. IDC estimates systems spending in the insurance industry will increase 13.3% through this year.

"The industry is changing in terms of demands by customers," says Theodore T. Tansi, vice-president of Phoenix Mutual Life Insurance Co., a Hartford, Conn.-based firm.

According to Tansi, nontraditional insurance applications are consuming a large amount of CPU resources. "Many of our additional products are not traditional but are linked to securities, such as tracking securities' prices," he says.

Other new insurance applications include proposal generation plus an increasing number of experimental applications, such as expert systems, which are highly CPU intensive. These applications are aimed at serving an increasingly sophisticated client base, Tansi says.

While much of Phoenix Mutual's work is done on microcomputers, demands for mainframe systems also continue to climb. "When you put a policy on the books, you need a CPU to administer it," Tansi says. Such demand led the firm to install an IBM 3090 late last year, and Phoenix Mutual reportedly plans to bring in an IBM 9370 in two or three months on an experimental basis.

Many financial services firms are adding computer power simply to keep up with the growth in business. Productivity is another reason. "There is an increasing share of things being automated," observes Alan Kornbluth, vice-president of corporate systems for American Express Co. "Technology is a way in which we deliver our products. We are not using technology just for the sake of technolgy."

Mainframes remain on American Express's shopping list. "American Express is experiencing mainframe growth. That growth is slower than it was a couple of years ago but higher this year than last," Kornbluth explains. IDC estimates that spending in the financial services industry will increase 19% through this year.

At E. F. Hutton & Co. in New York, hardware expenditures have increased gradually, but consistently, during the past five years and are expected to continue that way into the near future, according to Bernie Weinstein, first vice-president of information systems and telecommunications. The most significant recent investment is the $20 million purchase of 10,000 NCR Corp. 3390 microcomputers, first announced in October 1986.

Steady growth

"We have had a steady growth in computer spending in recent years," Weinstein says. Microcomputers will occupy the bulk of E. F. Hutton's spending plans for the next few years, Weinstein adds. After the PCs are placed throughout the company's nationwide offices as workstations for brokers, further expenditures are set to include applications software, networking, enhancement boards and peripherals.

Financial firms experiencing slower growth are happy with the systems already in place. "We bought an IBM 3090 Model 180 last year but haven't been growing all that much since. Over the next 12 months, we feel we have enough capacity with the 3090," says Jerry Conover, vice-president of the computer center for Avco Financial Services, Inc. in Irvine, Calif.

Industries experiencing less growth in business are also spending less on computers. IDC estimates that the combined systems spending of agriculture, mining and construction will decrease by 8.6% through this year.

Staff writer Alan J. Ryan and West Coast correspondent James A. Martin contributed to this report.

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INSIDE LINES

Will the Link break? The Software Link is getting down to the wire on its self-imposed target delivery date for PC-MOS, its 80386-based operating system. PC-MOS was announced in the fall and was supposed to ship in February. That date was subsequently rolled back to April. Software Link cofounder Gary Robertson says he will know after a meeting scheduled for tomorrow whether the product will ship this month. Meanwhile, the Atlanta-based company is garnering a lot of ink based on its relationship with network software vendor Novell in Orem, Utah, on which Robertson declined to comment. Apparently Novell has picked up some hints from its much-publicized relationship with IBM. "You should see the nondisclosure I had to sign," Robertson says.

End of the rainbow. While DEC's Rainbow personal computer has been on its way out for some time, DEC has at last written the product's final chapter. No more machines will be produced after the end of this year, and customers have been asked to place their final orders.

Will the AT still be around? Wang's IBM Personal Computer AT-compatible, whose introduction has been rumored for months, is not "vaporware," according to Ian Diery, Wang's head of U.S. marketing and operations. Wang has been taking orders for the Intel 80286-based micro and will officially announce the product in a few weeks, Diery said.

Take them, not us. Amdahl, National Advanced Systems and Honeywell Bull did their best to steer the U.S. government's sanctions on Japanese products toward microcomputers and away from their own Japanese-supplied mainframes and disk drives. In written filings to the government, the three firms offered helpful suggestions. For example, Honeywell Bull's filing said, "This definition would hit minicomputers, desktop and latptop computers and commodity products which are either not integral parts of large-scale systems or which can be obtained from non-Japanese sources."

Will he shop for Apples? Are Apple and DEC close to an official agreement on perfecting Macintosh-to-VAX links? Industry sources have speculated that Apple and DEC may soon announce a Decnet hookup for the Mac based on technologies developed by Decnet architect Stuart Wecker, now president of Technology Concepts in Sudbury, Mass. DEC President Ken Olsen's travel plans call for him to be on the West Coast on Tuesday. Stay tuned.

Take it back, boys. The legal moves of three European leasing companies challenging IBM apparently were stopped in the Netherlands by an Amsterdam District Court judge who denied an injunction request based on the lessors' claims that IBM violated regulations on pricing and maintenance. IBM officials reported that the judge refused to issue the injunction and ordered the lessors to send a circular customer letter retracting claims they made in an earlier customer letter when the suit was filed last month.

What would Tom Sr. think? American Express may become the next IBM 8100 user to defect to DEC, according to IDC Vice-President Frank Gens. Gens told attendees at IDC's annual DEC conference that American Express is considering VAXs to replace the discontinued IBM mid-range system. Aetna made the 8100-to-DEC leap last year.

Hit me with your best shot. Lotus is set to unveil today its strategies for tapping the power of IBM/Microsoft Operating System/2. Lotus has already committed to redoing 1-2-3 for the protected mode of OS/2. The firm is also expected to detail plans for the Presentation Manager, a graphics user interface for OS/2 based on Microsoft Windows.

It's a GEM. Digital Research is scheduled today to join the desktop publishing fracas with the release of Graphics Environment Manager Desktop Publisher. Unlike other desktop publishing packages on the IBM PC and compatibles that run under Microsoft Windows, Digital Research's product operates under GEM, its own graphics user interface.

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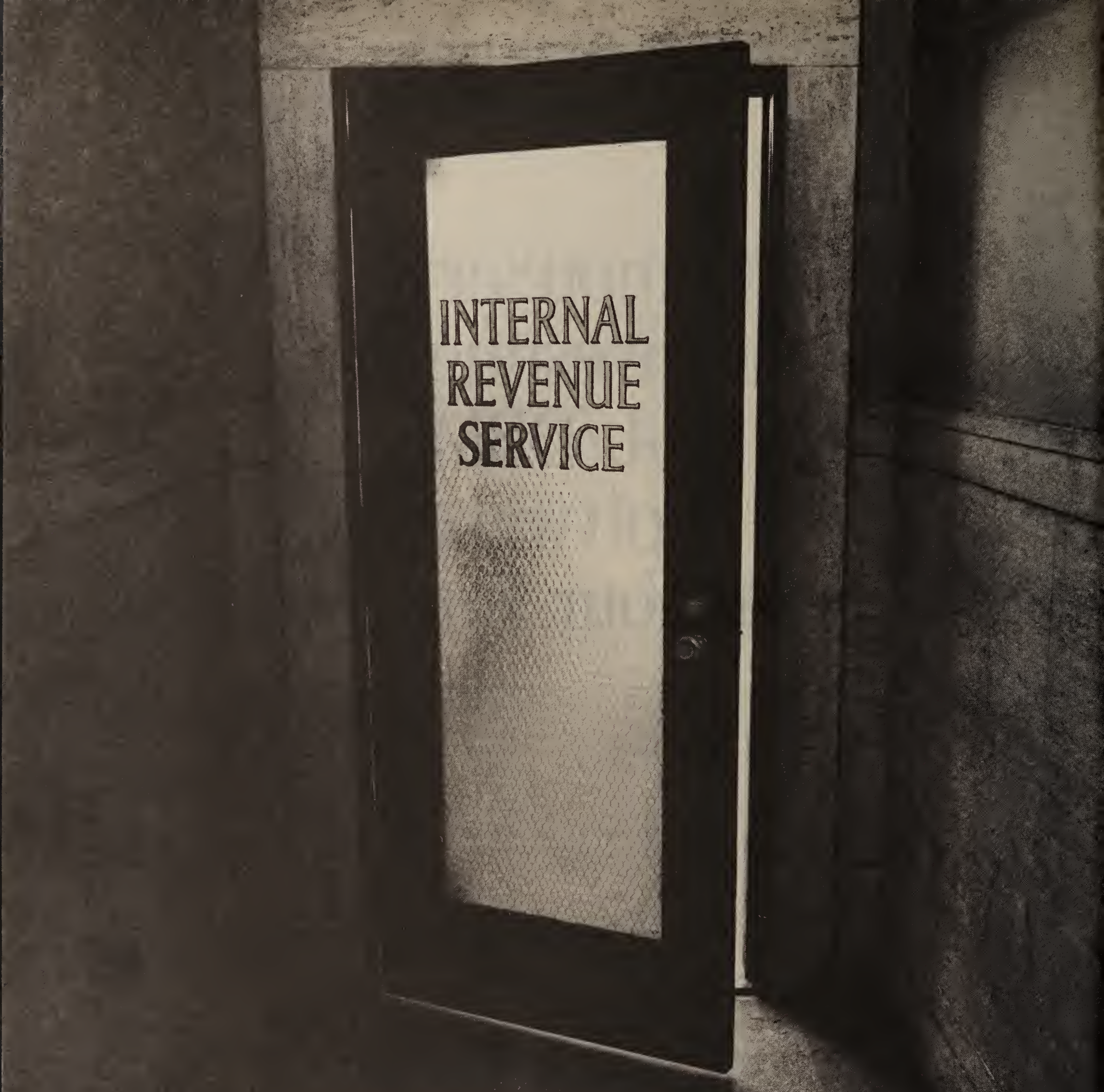

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